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Business and Defense Services Administration
Office of Technical Services

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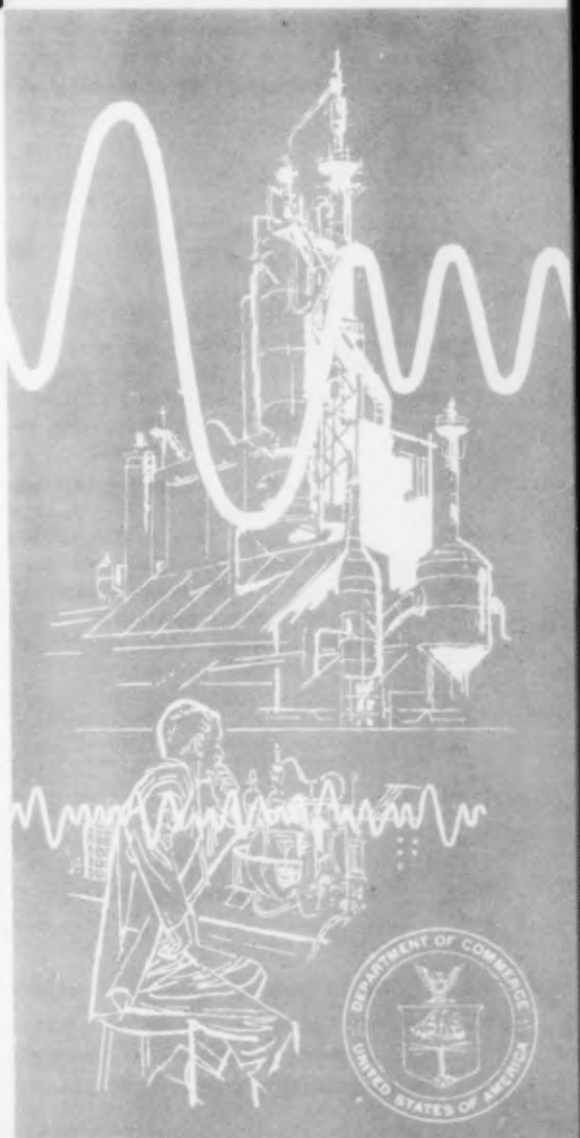

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Annual research task summary, 1960. Volume 7. Index. 677p. (PB 161 139) $3.00 96

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U. S. DEPARTMENT OF COMMERCE

BUSINESS AND DEFENSE SERVICES ADMINISTRATION

OFFICE OF TECHNICAL SERVICES

Vol. 34, No. 1 Pages 5 - 98 July 15, 196

ASTRONOMY

Air Force Missile Development Center, Holloman AFB, N. Mex.
PLANETARY ASTRONOMY FROM SATELLITE-SUBSTITUTE VEHICLES. III. PROGRAM OF NOVEL OBSERVATIONS FROM HIGH ALTITUDE BALLOONS, by F. Zwicky (California Inst. of Tech.). Dec 59, 12p. 10 refs. AFMDC-TN-59-38; AD-232 329.
Order from LC mi$2.40, ph$3.30 PB 145 737

The following three types of basic topics are discussed: (1) observations and experiments concerning the atmosphere above the maximum height of the balloon as well as those dealing with the contents of extraterrestrial space; (2) observations and experiments concerning the physico-chemical properties of the strata through which the balloon flies; and (3) observations in the downward directions. (Author) (See also PB 143 187)

Astrophysics

Colorado U., Boulder.
SOLAR ULTRAVIOLET RESEARCH, by William A. Rense. Final rept. for 1 Jan 57-31 Dec 59 on Contract AF 19(604)2181. [1959] 11p. 9 refs. AFCRC-TR-60-214.
Order from LC mi$2.40, ph$3.30 PB 145 846

Results of several Aerobee rocket flights are given especially with relation to the solar ultraviolet spectrographs. The quantum efficiencies of several new phosphors for far ultraviolet exciting radiation were measured in the laboratory as a continuation of previous work done.

Manchester U. (Gt. Brit.)
STUDIES IN LUNAR TOPOGRAPHY. I. DETERMINATION OF THE HEIGHTS OF MOUNTAINS ON THE MOON, by Zdenek Kopal and Gilbert Fielder. Technical scientific note no. 1 on Contract AF 61(052)168. Mar 59, 31p. 19 refs. AFCRC-TN-59-411; AD-232 260.
Order from LC mi$3.00, ph$6.30 PB 146 132

Following a brief introduction, in which the previous work on the determination of the heights of lunar mountains is summarized and its limitations pointed out, the second part of this paper contains an exhaustive discussion of the geometrical aspects of the problem of determination of the altitudes of lunar elevations by a triangulation of the shadows cast on the surrounding landscape during sunrise or sunset, and formulae are deduced relating explicitly the desired heights with the observed shadows to the requisite degree of accuracy. The second part of the present paper contains then a description of the procedure actually followed in securing the cinematographic data, essential for this purpose, at the Observatoire du Pic-du-Midi, and their subsequent microphotometric measurements at Manchester. (Author)

Stanford Electronics Labs., Stanford U., Calif.
RADAR ECHOES FROM THE SUN, by V. R. Eshleman, R. C. Barthle and P. B. Gallagher. Scientific rept. no. 6 on Contract AF 19(604)2193. 11 Jan 60, 15p. 6 refs. AFCRC-TN-60-135.
Order from LC mi$2.40, ph$3.30 PB 145 751

On April 7, 10, and 12, 1959, 15-minute trains of 30-second pulses were transmitted at 25.6 mc from a 40-kw transmitter. A four-rhombic antenna was used for both transmission and reception. The received data were recorded for later analysis on an electronic digital computer. The echoes were on the order of 40-50 db below the noise level after detection, but

from post-detection integration the presence of echoes has been demonstrated with chances for error on each day of less than 1 in 10^5. Continuing radar studies of the sun should provide important new data on various solar phenomena. (Author)

BEHAVIORAL SCIENCES

Human Engineering

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
TARGET SIZE AND VISUAL RECOGNITION, by William C. Steedman and Charles A. Baker. Rept. on Criteria for the Design and Arrangement of Displays. Feb 60, 23p. 2 refs. WADD Technical rept. 60-93.
Order from OTS $0.75 PB 161 661

This study was conducted to determine the speed and accuracy of form recognition as a function of the size of target forms for various amounts of detail resolution. The stimulus forms were generated by filling in, on a statistical basis, some of the cells of a 90,000-cell matrix. The subjects were shown a "briefing target" and instructed to locate that target on a display containing numerous other forms. The significant finding is that both search time and errors remain invariant until the visual angle subtense of the targets falls below 12 minutes; at values below 12 minutes performance deteriorates. This effect is independent of the range of resolutions investigated. The implications of these findings to equipment design are discussed. (Author)

Institute for Applied Experimental Psychology Tufts U., Medford, Mass.
HUMAN ENGINEERING BIBLIOGRAPHY 1957-1958. Rept. on Contract Nonr-494(13). Oct 59, 316p. 1400 refs. ONR rept. ACR-43.
Order from OTS $5.00 PB 161 125

This bibliography is one of a planned series of annual bibliographies of literature pertinent to human engineering. Two major considerations - ease of use and appropriate selection of material - strongly influenced this bibliography. As a result, five main parts exist: (1) a topical outline which defines over 300 topic headings established for this bibliography, (2) an index which associates the approximately 1400 bibliographic entries with the topic headings, (3) an alphabetic index of the common search terms which would aid those using this bibliography but who are unfamiliar with the topic headings, (4) an annotated bibliography of some 1400 citations, and (5) an index of the authors of these citations. (See also PB 131 507 and PB 131 507S)

Office of Naval Research, Washington, D. C.
HUMAN ENGINEERING IN THE NAVY, 1959, by Paul G. Cheatham. Mar 60, 14p. ACR-46.
Order from OTS $0.50 PB 161 428

In 1952-53 a survey of human engineering in the Navy was conducted by a Working Group in the Office of Naval Research, with the main purpose of providing a basis for recommendations on improving the over-all Navy human engineering program. In 1958, five years later, a new study was initiated to bring the 1953 report up to date and to show what changes have taken place in the Navy's human engineering effort during this interval. The significant developments which have occurred during the last five years are: (1) a ten-fold increase in the adequacy of coverage, (2) the median value of human engineering level of effort applied to systems has increased to about three man-months per month, (3) the "systems concept" has had a marked influence on the design of man-machine military systems such that human factors considerations have become a part of total systems planning, (4) the human engineer has risen in status so that he is now accepted completely as a professional peer by his fellow engineers and has become an effective member of the interdisciplinary design team. (See also PB 114 150)

Stanford Research Inst., Menlo Park, Calif.
A METHOD FOR PERFORMING HUMAN ENGINEERING ANALYSIS OF WEAPON SYSTEMS, by Albert Shapero and Charles Bates, Jr. (Aerospace Medical Lab.) Rept. on Contract AF 33(616)5688. Sep 59, 71p. 2 refs. WADC Technical rept. 59-784; SRI Proj. IU-2568.
Order from OTS $2.00 PB 161 660

One problem that has faced those charged with responsibility for the human elements of a weapon system is the development of a method of analysis which integrates the analysis of a system's human elements with that of the over-all system analysis. This kind of analysis is required to determine how the human elements affect the over-all system and how the over-all system affects its human elements, and is essential to the development of effective weapon systems. A weapon system analysis and integration model has been developed that includes the system's human elements and that can be employed as an aid in the analysis, synthesis, evaluation, planning, and management control of weapon systems. (Author)

Personnel and Training

Applied Psychology Panel, Office of Scientific Research and Development.
HUMAN FACTORS IN MILITARY EFFICIENCY; TRAINING AND EQUIPMENT. Summary technical rept. vol. 2, Contract OEMsr-1131. 1946, declassified 23 Apr 58, 371p. 522 refs.
Order from LC mi$11.10, ph$57.60 PB 139 779

Contents:
Training of specialized military personnel
Psychological principles in military training
The design and operation of special types of military equipment
Guiding principles for future equipment development

Institute of Personality Assessment and Research, U. of California, Berkeley.
FAKABILITY OF THE AIR FORCE PREFERENCE INVENTORY, by Harrison G. Gough. Rept. on Contract AF 18(600)08. Nov 59, 20p. 5 refs. WADC-TN-59-199; AD-231 379.
Order from LC mi$2.40, ph$3.30 PB 146 143

This study concerns (1) recognition of the possibility of faking responses to the Air Force Preference Inventory in order to present a better impression, (2) a consideration of a possible index for detecting faking, and (3) an analysis of the psychological correlates of this index. An indication of faking was revealed by the comparison of three Air Force Preference Inventory scores made by an experimental sample of 30 college students tested under normal administration and then requested to fake. From Inventory items showing marked differences in the second testing, a dissimulation scoring key was constructed and applied to the college student sample and two Air Force officer samples. Significant differences were found between dissimulation scores of normal versus faked testing of the college student group and there was a negative correlation between the two sets of scores. Testing of additional samples, however, would be needed in order to establish precise cutting points for distinguishing between authentic and faked test protocols. (Author)

Naval Personnel Research Field Activity, Washington, D. C.
RELATIONS BETWEEN ELAPSED TIME SINCE TESTING AND PREDICTION OF SCHOOL ACHIEVEMENT, by John M. Proctor and David Kipnis. Nov 59, 14p. 5 refs. BuPers Technical Bulletin 59-26.
Order from LC mi$2.40, ph$3.30 PB 146 248

The basic question in this research was: Do BTB scores have the same predictive value for career men as for recruits? The data were obtained at the Submarine Nuclear Power School. Prediction of Nuclear Power School grades using the sum of scores on General Classification Test (GCT) and Arithmetic Test (ARI) as the predictor was more accurate in younger (18-21 years of age) and more junior (Seamen) groups than in older and more senior groups. The desirability of a test developed specifically for use with career enlisted personnel is indicated. (Author)

Naval Personnel Research Field Activity, Washington, D. C.
THE VALIDITY OF THE BASIC TEST BATTERY AT NUCLEAR PROPULSION SCHOOLS, by Leonard Wollack. July 59, 15p. 6 refs. BuPers Technical Bulletin 59-23; AD-231 131.
Order from LC mi$2.40, ph$3.30 PB 146 247

General Classification Test (GCT) was the best single predictor of school performance ($r_c = .44$). Mechanical Comprehension (MECH) was the poorest ($r_c = .31$). GCT+ARI (ARI=Arithmetic Test) was the most valid two-test combination ($r_c = .51$), and GCT+ARI+MECH produced a few more points of validity ($r_c = .55$). Tests of the BTB gave better prediction of school performance in the fast sections than in the slow sections although the differences in prediction of fast and slow sections by individual tests were not statistically significant. It would seem that if the BTB is to be continued as the selection instrument for the NP program, better validity would be obtained with GCT+ARI instead of the current combination of ARI+MECH.

Naval Radiological Defense Lab., San Francisco, Calif.
QUANTIFICATION OF BODY CONFIGURATION IN GEOMETRICAL TERMS, by A. R. Behnke, O. E. Guttentag, and C. Brodsky. 1 Dec 57, 36p. 15 refs. Research and development technical rept. USNRDL-TR-204; AD-160 462.
Order from LC mi$3.00, ph$6.30 PB 146 221

Circumferential anthropometric measurements and the bideltoid diameter make possible in healthy men: (a) an accurate estimate of body weight, (b) a quantification of body configuration, (c) an estimate of excess fat, muscular development, and degree of leanness, (d) a body pattern analysis showing intra-individual variations and inter-individual score comparisons.

Office of Scientific Research and Development. Div. 6.
METHODS AND DEVICES DEVELOPED FOR THE SELECTION AND TRAINING OF SONAR PERSONNEL. Summary technical rept. vol. 4, Contract OEMsr-1131. 1946, declassified 23 Apr 58, 244p. 230 refs.
Order from LC mi$11.10, ph$37.80 PB 139 778

Ohio State U. Research Foundation, Columbus.
CONTRIBUTION OF STANDARD SEQUENCE TO AN AIR DEFENSE TASK, by Henry M. Moser, John J. Dreher, and Susan M. Wolfe. Technical rept. no. 39 on Contract AF 19(604)15/7. Jan 57, 23p. 5 refs. AFCRC-TN-56-73; AD-110 059.
Order from LC mi$2.70, ph$4.80 PB 137 945

Typical Air Defense surveillance messages were read with elements in standard order and in random order to two groups of listeners. Each group practiced logging data in one particular type of sequence for seven hour-long training periods, at which time the standard and random orders were interchanged to assess the performance of listeners on an unfamiliar type of presentation. A final proficiency test consisting of extremely rapid telling of messages in regular order was administered to both groups to evaluate the two types of training. Results indicated: (1) When using standard vocabulary and one type of message, the message items may be presented in different sequence to trained groups without seriously affecting reception. (2) Initial results produced better intelligibility scores for the standard-ordered material. However, training appeared to negate this original advantage. (3) Groups trained in standard and random sequence, respectively, showed no significant difference when the presentation method was interchanged. (4) Groups trained in standard and random sequence, respectively, showed no significant difference when subjected to speed tests of standard-ordered messages. (Author)

Personnel Lab., Wright Air Development [Division] Lackland AFB, Tex.
PERSONALITY TRAITS RELATED TO EFFECTIVENESS OF JUNIOR AND SENIOR AIR FORCE OFFICERS, by Ernest C. Tupes. Nov 59, 13p. 4 refs. WADC-TN-59-198; AD-231 256.
Order from LC mi$2.40, ph$3.30 PB 146 142

It has been determined that officer candidates in training can produce reliable personality ratings of their peers that are predictive of effectiveness ratings as Air Force junior officers. This study repeats the investigation with field-grade officers. It was found that the factor structure underlying peer ratings of personality traits of senior officers closely resembled that of the junior officers. With one exception, there was agreement between junior and senior officers on the relative importance for officer effectiveness of 30 personality traits. The two groups showed even greater similarity in the relationships of the personality trait ratings to Officer Effectiveness Reports. Hence any officer selection program which screens on personality variables essential to junior-officer success will also select for traits characteristic of effective field grade officers. (Author)

Personnel Lab., Wright Air Development [Division] Lackland AFB, Tex.
PREDICTION OF CRITERIA FOR MEDICAL AND DENTAL SPECIALTIES FROM AIRMAN CLASSIFICATION BATTERY AC-2A, by Leland D. Brokaw. Dec 59, 11p. 2 refs. WADC-TN-59-202. AD-231 257.
Order from LC mi$2.40, ph$3.30 PB 146 141

Validation of Airman Classification Battery AC-2A for training grades in five medical and one dental specialty, and for Airman Proficiency Test scores in two medical career fields, Pharmacy Specialist, and Medical Administrative Specialist, reveals a satisfactory predictive efficiency for the General Aptitude Index. Although the Electronics Aptitude Index seems of comparable validity, there is no basis for recommending a change in the selective aptitude index.

Psychology

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
GUIDE TO DESIGN OF AIR FORCE CHECK-LIST PUBLICATIONS, by David W. Rees. Rept. on Human Factors in Advanced Flight. Dec 59, 61p. 9 refs. WADC Technical rept. 59-758.
Order from OTS $1.75 PB 161 665

Many problems face the designer who wants to present job information in check-list form. Perhaps the major problem is that of condensing complex job information into the abbreviated form. Another important problem involves how best to lay out check-lists so as to maximize their effectiveness on the job. This guide is intended to help alleviate these problems by providing a handbook of background information and general principles for the guidance of the designer. The purpose and function of check-list publications are discussed, and a general concept for design is advanced. A method for analyzing and determining the essential information requirements of complex procedures is presented, and a systematic method for condensing these requirements into check-list items is proposed. Specific recommendations pertaining to organization, layout, and legibility of check-list publications are made. (Author)

Applied Mathematics and Statistics Lab., Stanford U., Calif.
SOME ASYMPTOTIC PROPERTIES OF LUCE'S BETA LEARNING MODEL, by John Lamperti and Patrick Suppes. Technical rept. no. 22 on Contract Nonr-225(17). 24 Apr 59, 15p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 146 063

The point of the present paper is to study asymptotic properties of the beta model for certain standard probabilistic schedules of reinforcement.

Illinois U. Coll. of Education, Urbana.
SOME EMPIRICAL STUDIES OF THE RELIABILITY OF INTERPERSONAL PERCEPTION SCORES, by Stanley A. Rudin, Irving Lazar and others. Technical rept. no. 4 on Contract N6ori-07135. May 52, 13p. 5 refs. ATI-152 796.
Order from LC mi$2.40, ph$3.30 PB 146 609

This study is an attempt to determine whether such reliable individual differences exist. Specifically, it is an investigation of the reliabilities of the measures used in a study of effectiveness of basketball teams, reported by Fiedler, Hartmann, and Rudin. Consistency of the similarity measures can be demonstrated in these ways: (1) over items; (2) over persons ("perceivees"; the objects of perceptions); (3) over time. The first two methods have been applied to Assumed Similarity scores in this study. Only the first type of reliability was studied for Real Similarity.

Laboratory of Aviation Psychology, Ohio State U. Research Foundation, Columbus.
A SIMPLIFIED ELECTRONIC TRACKING APPARATUS (SETA), by Peter Gain and Paul M. Fitts. Rept. on Contract 41(657)70. Nov 59, 17p. 4 refs. WADC Technical rept. 59-44.
Order from OTS $0.50 PB 161 550

This report describes a simplified electronic tracking apparatus (SETA) which is compact, economical, and portable. The subject's task is to keep the pointer of a zero-center meter at the null point by manipulating a control device. The movements of the meter-pointer for which the subject attempts to compensate are introduced by a voltage across a potentiometer driven by a rotary cam. This voltage is compared with a corresponding voltage generated by the subject. This comparison is made by one of three K2X Philbrick operational amplifiers in cascade. The output of the comparison is simply the sum of the voltages, or error. Error is then introduced to the subject's display and to a second amplifier, which rectifies it, resulting in an output of absolute value of the error which is integrated by the third amplifier and displayed on a voltmeter on the experimenter's console. (Author)

Michigan U. [Research Inst.] Ann Arbor.
AN APPLICATION OF A NONMETRIC MODEL FOR MULTIDIMENSIONAL ANALYSIS OF SIMILARITIES, by C. H. Coombs. Rept. on Project Michigan, Contract DA 36-039-sc-52654. June 58, 14p. 9 refs. Rept. no. 2144-269-T; AD-202 609.
Order from LC mi$2.40, ph$3.30 PB 145 787

A nonmetric multidimensional model for analyzing similarities data is presented and its application to a confusion matrix on Morse Code signals is recounted. Some of the major problems remaining in the development of the model are summarized. (Author)

Minnesota U., Minneapolis.
AN ATLAS OF SEMANTIC PROFILES FOR 360 WORDS, by James J. Jenkins, Wallace A. Russell, and George J. Suci. Technical rept. no. 15 on Studies on the Role of Language in Behavior, Contract N8onr-66216. Mar 57, 42p. 10 refs. AD-129 903.
Order from LC mi$3.30, ph$7.80 PB 146 353

The semantic differential introduced by Osgood (Psychol. Bull. 49:197-237, 1952 and J. Exp. Psychol. 50:325-338, 1955) was studied to relate it to other associative techniques and to mediation and transfer phenomena. A group of 360 words (concepts) from "abortion" to "zenith" was assembled. Each concept was rated by 15 male and 15 female subjects on a set of twenty 7-point descriptive scales. Each scale was a set of paired opposites, such as hard vs soft, cruel vs kind, etc. In each scale, the number 1 represented the ultimate in one of the descriptions (such as cruelty) and 7 represented the ultimate in its opposite (such as kindness). Profiles of the mean scale ratings are presented to 2 decimal places for each concept. Application for the above "atlas" of concepts is suggested for testing the associative-clustering hypothesis of Jenkins and Russell (J. Abnormal Social Psychol. 47:818-821, 1952) and the perceptual-facilitation hypothesis of O'Neil, and the learning and generalization hypothesis of Russell and Storms (J. Exp. Psychol. 49:287-293, 1955), and for examining the interrelationships of the semantic differential data to the simple word association data of Russell and Jenkins (PB 117 888) and the index of meaningfulness of Nobel (Psychol. Rev. 59:421-430. 1952).

Research Center for Group Dynamics, U. of Michigan, Ann Arbor.
STUDIES IN SELECTION LEARNING. IV. THE ACQUISITION AND RETENTION OF INCIDENTAL ITEMS IN SELECTION LEARNING, by Eugene Burnstein. Technical rept. no. 4 on Contract AF 49(638)367 and National Science Foundation Grant G-4951. Oct 59, 11p. 5 refs. AFOSR-TN-60-265.
Order from LC mi$2.40, ph$3.30 PB 146 231

Previous studies on selection learning have demonstrated superior retention of selection learners utilizing informative cues (IS) to those utilizing uninformative cues (US). These findings were accounted for by assuming that interference due to the learning of incidental items dissipates during the interpolated interval The hypothesis was advanced that selection learners using informative cues will show higher incidental learning than selection learners using uninformative cues, but that they will also show a faster rate of forgetting of the incidental material. Experimental confirmation was obtained with respect to the differences in acquisition. Although the results pertaining to the retention of incidental items were in the predicted direction they failed to reach the acceptable level of significance. (Author) (See also PB 145 101)

Willow Run Lab., U. of Michigan, Ann Arbor.
PSYCHOLOGICAL MEASUREMENT AND A THEORY OF DATA, by C. H. Coombs. Rept. on Project Michigan, Contract DA 36-039-sc-78801. Sep 59, 32p. 56 refs. Rept. no. 2900-23-T; AD-226 335.
Order from LC mi$3.00, ph$6.30 PB 145 830

A theory of data is presented which characterizes behavioral data in terms of three basic dichotomies and leads to an eightfold classification of models in abstract terms. This classification greatly simplifies the apparently complex variety of psychological measurement models. The models within each of these eight classes are presented and compared with respect to the kinds of assumptions they make about the same kind of data. The mathematical character of each model is discussed, with numerous psychological examples of the kind of data for which each is designed. For each model, references are indicated which provide instructions on details of the procedures to be followed in their application. (Author)

Willow Run Labs., U. of Michigan, Ann Arbor.
SUBJECTIVE PROBABILITY IN DECISION THEORIES, by Ward Edwards, Rept. on Project Michigan, Contract DA 36-039-sc-52654. Mar 59, 20p. 26 refs. Rept. no. 2144-361-T.
Order from LC mi$2.40, ph$3.30 PB 145 831

This report is concerned with theories which explain choices among risky alternative courses of action by means of the concepts of utility, or subjective value, and subjective probability. If the subjective probabilities of a set of events of which some one must happen and not more than one can happen must add up to 1, then utility can be measured on an interval scale and subjective probability on a ratio scale. But if subjective probabilities do not have this additivity property, then both utility and subjective probability must be measured on a ratio scale. If subjective probabilities do have the additivity property, and if the decision model in which they are used is in principle applicable to any conceivable set of events, then, whenever objective probabilities are defined, subjective probability must equal objective probability. This means that the concept of subjective probabilities which must add to 1 and decision models based on that concept, cannot be very helpful in explaining decision making; a large amount of data indicates that subjective probability cannot always equal objective probability. One alternative is to use a decision model in which subjective probabilities need not add up to any particular constant. One property of such a model is that utility must have a true zero point. The only reasonable zero point for utility is where one now is. Any form of the expected utility maximization hypothesis implies a strong relationship among the slopes of indifference curves for simple bets. This relationship leads to an experimental test of the applicability of models of this class. (Author)

Harvard Medical School, Boston, Mass.
CHANGES IN CIRCULATION DURING THE HIBERNATING CYCLE, by Charles P. Lyman. Rept. for 1 Feb-30 Apr 59 on Contract AF 41(657)190. June 59, 6p. Technical note AAL-TN-59-13, AD-230 849.
Order from LC mi$1.80, ph$1.80 PB 146 237

As hibernation begins, heart rate and blood pressure drop rapidly, followed by a drop in body temperature. As the animal enters deeper into the hibernating state, the peripheral resistance increases linearly with temperature, and the pulse pressure becomes greater. By the time the deeply hibernating state has been reached, the heart rate may be as low as four beats a minute; but, because of the high pulse pressure and high peripheral resistance, a rather remarkably high mean blood pressure is maintained. At this time usually the systolic pressure varies between 60 and 90 mm. Hg., and the diastolic pressure varies between 30 and below 10 mm. Precise measurements of the lowest diastolic pressures have not been possible because of slight drifts in the recording apparatus.

Illinois U. [Urbana].
STUDIES ON THE EIGHTH CRANIAL NERVE OF BIOLOGICAL SUBJECTS, by F. R. Steggerda. Jan 60, 14p. 10 refs. AFMDC Technical rept. 60-2.
Order from LC mi$2.40, ph$3.30 PB 146 191

Various techniques for implanting recording electrodes on the cortical projection areas for the vestibular system and on various branches of the eighth cranial nerve are presented. Preliminary evidence indicates that ablation of the vestibular-cortical area as well as sectioning of the eighth cranial nerve allows the cat to become less disoriented and uncoordinated than the normal unoperated cat when exposed to zero or subgravity states. It appears that complete bi-labyrinthectomy is more effective in producing freedom from disorientation and uncoordination than complete ablation of the vestibular-cortical area in the cerebrum when the animals are exposed to zero or subgravity conditions. (Author)

Anatomy and Physiology

Arctic Aeromedical Lab., Ladd AFB, Alaska.
THE EFFECT OF TEMPERATURE ON MYOCARDIAL ADENINE NUCLEOTIDE LEVELS AND THE ACTIVITY OF VARIOUS OXIDASES IN RABBITS AND ARCTIC GROUND SQUIRRELS, by John P. Hannon. Nov 59, 18p. 12 refs. Technical rept. 59-2.
Order from LC mi$2.40, ph$3.30 PB 146 262

Certain physiological and biochemical properties of the hearts of rabbits (non-hibernators) and active arctic ground squirrels (hibernators) were compared. When the anesthetized intact animals were rendered hypothermic in ice water, ventricular tissue removed from rabbits with rectal temperatures of 15° C showed that a conversion of ATP to ADP had occurred. Lowering the body temperature to 15° C in squirrels had no effect on ventricular ATP levels. At both normal and hypothermic temperatures, squirrel ventricles contained considerably more adenine nucleotide (ATP and AMP) than rabbit ventricles. Measurements were made of the levels of several different ventricular oxidase activities at 38° and at 15°. At 38° squirrels exhibited a higher glutamic but a lower β-hydroxybutyric-, malic-, and succinic-oxidase activity than rabbits. At 15° similar species differences were found. (Author)

Audiology Lab., Northwestern U., Evanston, Ill.
THE ALTERNATE AND SIMULTANEOUS BINAURAL BALANCING OF PURE TONES, by James F. Jerger and Earl R. Harford. Jan 60, 13p. 18 refs. AFSAM rept. no. 60-30; AD-232 649.
Order from LC mi$2.40, ph$3.30 PB 146 144

The interaural intensity relations producing equal loudness when pure tones were presented alternately, and median-plane-localization when they were presented simultaneously to the two ears, were studied in normals monaurally masked normals, and patients with unilateral sensorineural hearing loss, both with and without loudness recruitment. Results indicate that the two types of judgment do not yield equivalent results. In general, median-plane-localization requires more nearly equivalent SPLs at the two ears than does equal loudness, but there are important qualifications. A significant clinical implication arising from these findings is that loudness recruitment must always be measured by alternate, never by simultaneous, stimulation of the two ears. (Author)

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
NADC BIOLOGICAL INSTRUMENTATION SYMPOSIUM OF 10 DECEMBER 1958; FOURTH LETTER REPORT CONCERNING, by J. Gordon, R. Jensen and others. Rept. on Proj. MR 005.15-0002.2. 28 Dec 59, 8p. 4 refs. TED ADC AE 1412.1; TED NAM AE 1403.1.
Order from LC mi$1.80, ph$1.80 PB 145 700

The present communication constitutes a preliminary report on the usefulness of the EEG, electroencephalograph, as a means of monitoring certain aspects of cerebral function in air-and spacecraft pilots while in flight and constitutes a feasibility study.

Dunlap and Associates, Inc. [Stamford, Conn.]
RELATIVE MOTION II. THE NATURE OF RELATIVE MOTION SITUATIONS, by Charles R. Kelley, Hugh M. Bowen and others. Rept. on Contract N61339-316. 19 Nov 59, 113p. 36 refs. Technical rept. NAVTRADEVCEN-316-1.
Order from LC mi$6.00, ph$18.30 PB 145 756

The study defined relative motion as the change in the relative position of two moving objects which can be perceived or understood in terms of more than one frame of reference. A groundwork for psychological theory was developed which yielded guidlines for

selecting the "outside-in" versus the "inside-out" reference frame for operator tasks. The appropriateness of a reference frame was found to be a function of (a) The speed with which a given task must be carried out and other operator requirements. (b) The physical environment, especially as it affects the richness and size of visual cues. (c) The nature of accessory cues (e. g. instrumentation). The experimental portion of the study identified shape of a target as one of the crucial clues to its movement when observed by a moving observer. It also identified an important constant error in the judgment of a moving target by a moving observer.

George Washington U. School of Medicine, Washington, D. C.
EFFECT OF LIPOTROPIC FACTORS ON COLD PHYSIOLOGY. II. PREVENTIVE AND CURATIVE EFFECTS OF COLD ON FATTY LIVERS, by Carleton R. Treadwell. Rept. on Contract AF 18(600)463. Sep 57, 20p 5 refs. Technical note AAL-TN-57-24; AD-230 834.
Order from LC mi$2. 70, ph$4. 80 PB 146 243

Four experiments are reported: (1) effect of cold on growth, efficiency ratio, and liver fat in adult rats; (2) curative effect of cold on fatty livers; (3) preventive and curative effect of cold on cholesterol fatty livers; and (4) effect of high dietary fat levels on liver fat in the cold. Results indicate that (1) cold is an effective lipotropic agent in both young and adult animals; (2) cold has a curative as well as a preventive effect on fatty livers; (3) cold does not have preventive or curative effects on the blood or liver cholesterol in cholesterol-fed rats; (4) cold has a preventive and curative effect on the neutral fat fraction of the liver in cholesterol-fed rats in the cold; and (5) the lipotropic effect of cold appears to be due to an effect on the neutral fat fraction with all of the diets studied.

School of Aviation Medicine, Brooks AFB, Tex.
CARBON MONOXIDE CAPACITY MEASUREMENTS ON HUMAN AND RAT SKELETAL MUSCLE, by James P. Ellis, Jr., Robert T. Clark and others. Oct 59, 7p. 9 refs. Rept. 59-25. AD-231 541.
Order from LC mi$1. 80, ph$1. 80 PB 146 189

Two methods were comparatively evaluated for subsequent use as a measure of the CO capacity of animal tissues. One method was based on measurement of the volume of carbon monoxide extracted from muscle homogenates which had previously been equilibrated with known $CO-N_2$ mixtures; the other method was based on estimation of the CO capacity from the spectrophotometric differential determination of the hemoglobin and myoglobin content of the muscle. A comparative analysis, employing the two methods, was also carried out on human and rat muscle.

School of Aviation Medicine, Brooks AFB, Tex.
A STUDY OF THE REFERENCE AND 90-DAY AUDIOGRAMS OF A GROUP OF AIR FORCE AIRCRAFT AND ENGINE MAINTENANCE MEN, by Daryle L. Waldron. Oct 59, 14p. 7 refs. Rept. 59-96.
Order from LC mi$2.40, ph$3.30 PB 146 187

This report presents a descriptive analysis of these audiograms and of the differences between them.

Tufts [U.] School of Medicine, Boston, Mass.
METABOLISM OF FATTY ACIDS AND KETONE BODIES IN ANIMALS EXPOSED TO COLD, by David Rapport. Rept. for 31 Jan-30 Apr 58 on Contract AF 18(600)583. June 58, 15p. 3 refs. Technical note AAL-TN-58-5; AD-230 837.
Order from LC mi$2. 40, ph$3. 30 PB 146 239

Contents:
Development of a method of isolating non-phosphorus containing esters of fatty acids
Standardization of a method for paper chromatography of phospholipids
Gas chromatography of lipids and derivatives
Methods developed for oxidative phosphorylation studies
Adenosinetriphosphatase incubation procedure
Measurement of inorganic phosphate from ATP breakdown
Further work on the volatile lipid formed during the metabolism of albumin-palmitate-1-C^{14}
Metabolic effects of hypothermia in vitro
Continuation of studies on acetate oxidation by a homogenate system

Tufts U. School of Medicine, Boston, Mass.
METABOLISM OF FATTY ACIDS AND RELATED SUBSTANCES IN ANIMALS EXPOSED TO COLD, by David Rapport. Rept. for 1 Feb-30 Apr 59 on Contract AF 41(657)145. June 59, 10p. 2 refs. Technical note AAL-TN-59-17; AD-230 851.
Order from LC mi$1.80, ph$1.80 PB 146 236

The addition of glucose to the supernatant fraction resulted in a 20% increase in $C^{14}O^2$ production from acetate-1-C^{14} by both control and cold-fasted mitochondria. In addition, glucose plus hexokinase was a more potent stimulator of acetate oxidation than glucose plus the supernatant. The mitochondria from the control rats oxidized acetate much more rapidly in the presence of glucose plus hexokinase plus the supernatant, while the cold-fasted mitochondria oxidized acetate no faster than when glucose and hexokinase were present alone. AMP and ATP appeared to be equally effective in promoting acetate oxidation by control mitochondria. ATP caused cold-fasted mitochondria to oxidize acetate at appreciably higher rates than did AMP. Findings indicated that the serious defects in acetate oxidation in the cold-fasted liver slices and homogenates did not appear in the mitochondria.

Tufts U. School of Medicine, Boston, Mass.
RELATIVE MERITS OF SLOW VERSUS RAPID REWARMING AND INTERNAL VERSUS EXTERNAL REWARMING FOLLOWING ACUTE GENERAL AND LOCAL HYPOTHERMIA, I, by Henry E. D'Amato and Benjamin G. Covino. Rept. on Contract AF 41(657)183. June 58, 4p. Technical note AAL-TN-58-21; AD-230 840.
Order from LC mi$1.80, ph$1.80 PB 146 238

General Hypothermia: Studies were made to ascertain the cardiovascular changes which occur during cooling and rewarming techniques. No gross neurological abnormalities were observed in 15 dogs who had been rendered hypothermic by immersion in crushed ice. All animals appeared healthy, exhibiting normal appetite and activity. No behavioral changes were observed. No cardiovascular collapse occurred in any of the 4 animals cooled to a rectal temperature of 25°C and rapidly rewarmed or cooled to a rectal temperature of 25° to 30°C and slowly rewarmed. Local hypothermia: The right hind paws of 5 rabbits were maintained at a temperature of -2° to -8°C (as measured by a needle thermister probe placed beneath the skin) for 30 min and subsequently rewarmed in warm (45°C) air. All animals developed a severe case of frostbite. Five rabbits were subjected to the same procedure except that the limbs were rewarmed rapidly in hot (45°C) water. Rapid rewarming appeared to be more efficacious than slow rewarming in cases of severe frostbite of 30 min duration.

Vision Research Labs., U. of Michigan, Ann Arbor.
DETECTABILITY OF TARGETS CONSISTING OF MULTIPLE SMALL POINTS OF LIGHT, by A. B. Kristofferson and W. N. Dember. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Sep 58, 25p. 9 refs. Rept. no. 2144-298-T.
Order from LC mi$2.70, ph$4.80 PB 146 000

An element-contribution hypothesis developed previously to account for the detectability of symmetric, uniform, continuous targets is extended to the case of targets consisting of two, three, and five discrete points of light. The data presented on the detection probability of such targets are analyzed with respect to both the modified element-contribution hypothesis and the hypothesis of statistical summation of independent events. Contrast thresholds for these targets are predicted from the data for uniform circular targets of various diameters in conjunction with the data for a single-point target at various intrafoveal positions.

Washington U., Seattle.
THERMAL STRESS AND PHYSIOLOGICAL STRAIN, by L. D. Carlson and K. J. K. Buettner. Rept. on Contract AF 18(600)1467. June 57, 14p. 19 refs. Technical note AAL-TN-57-13; AD-230 831.
Order from LC mi$2.40, ph$3.30 PB 146 242

The evaluation of environmental stress and the resulting physiological strain is presented. Environmental stress is defined as the tendency of the environment to cause a change in the individual. Strain is defined as the change in the homeotherm brought about by the stress (the alteration in physiological function to maintain temperature) and the degree to which this change is effective. A statement of the environmental stress at temperatures below 21°C should include air temperature, wind decrement, and radiation increment. The mechanisms available for maintenance of heat balance with a negative load are increased heat production and added insulation. Departure from the steady state will show an increased heat production, a decreased skin temperature. The environmental stress at temperatures above 21°C in the clothed individual includes air temperature, wind velocity, radiation gain, and water vapor pressure. The mechanisms available for maintenance of heat balance were found to be increased blood circulation to the skin and evaporation.

Willow Run Labs., U. of Michigan, Ann Arbor.
THE MAGNITUDE OF THE PULFRICH STEREOPHENOMENON AS A FUNCTION OF TARGET VELOCITY, by Alfred Lit. Rept. on Project Michigan, Contract DA 36-039-sc-52654. Jan 59, 16p. 10 refs. Rept. no. 2144-362-T.
Order from LC mi$2.40, ph$3.30 PB 145 785

When filters of unequal optical density are placed in front of the two eyes, a target which is actually oscillating in a frontoparallel plane appears nearer than it really is for one direction of stroke and farther than it really is for the return stroke (Pulfrich stereophenomenon). Measurements of the near and far displacements of a black vertical rod have been obtained for a wide range of target velocities under each of several conditions of unequal binocular retinal illuminance. The experimental data show that, for any given difference in binocular retinal illuminance, the near and far displacements progressively increase as target velocity is increased. The data show also that, for any given target velocity, the near and far displacements progressively increase as the difference in binocular retinal illuminance is increased. The obtained results are analyzed in terms of an hypothesized absolute visual latent period whose magnitude is assumed to be an inverse function of level of retinal illuminance. The results are shown to be in good quantitative agreement with predictions based on the geometrical theory of the Pulfrich effect. Discrepancies at low target velocities are noted and discussed. (Author)

Biochemistry

Institute of Psychiatry, Maudsley Hospital, London (Gt. Brit.)
ADVANCED STUDY OF CHEMICAL MECHANISMS IN CEREBRAL FUNCTIONING. Final technical rept. no. 2 for 1 Nov 58-31 Oct 59 on Contract DA 91-591-EUC-882-01-1018-59. [1959] 12p. 1 ref. AD-230 070.
Order from LC mi$2.40, ph$3.30 PB 146 204

Methods have been examined for the partial purification of a cerebral phosphoprotein, attached to particulate matter and undergoing metabolic change when intact cerebral tissues are stimulated electrically. The phosphoprotein was not extracted from tissue residues by solutions of sodium chloride or magnesium sulphate at 2.5-3.0μ; by acidic or alkaline buffers or by treatment with n-butanol. Complete solution was obtained with a sulphonated alkyl detergent, presumably as a result of micelle formation. Other detergents lead to a degradation of the phosphoprotein. From solution, the material can be precipitated with acetone at low temperature and dissolved in dilute alkali. The results are discussed with regard to the importance of the phosphoprotein in the activity metabolism of nervous tissue and aspects for future study are indicated.

Naval Radiological Defense Lab., San Francisco, Calif.
EFFECTS OF X-IRRADIATION ON LIPID METABOLISM. IV. LIPOGENESIS FROM ACETATE-C^{14} BY THE LIVER, by W. L. Warner, S. R. Lerner, and C. Entenman. 23 Oct 57, 25p. 16 refs. Research and Development Technical rept. USNRDL-TR-194; AD-160 461.
Order from LC mi$2.70, ph$4.80 PB 145 829

Rats, mice and guinea pigs were subjected to whole body X-irradiation and the uptake of C^{14} from acetate-C^{14} into liver lipids and exhaled CO_2 was determined. The conversion of acetate-C^{14} to lipid C^{14} in liver slices prepared 24 hours after irradiation was increased as much as 20 fold in rats, 2 fold in guinea pigs and not at all in mice. The changes noted were roughly correlated with the levels of liver glycogen. The data offer a possible explanation for the previously observed increases in blood lipid levels following X-irradiation. (Author)

Schulz, G. V.
TEMPERATURE DEPENDENCE OF SECOND VIRIAL COEFFICIENT IN SERUM ALBUMIN SOLUTIONS, by G. V. Schulz, H. Ende and H. Inagaki. Technical rept. (Final) 1 Nov 58-30 Oct 59, on Thermodynamical Behaviour of Albumin in Solution, Contract DA 91-591-EUC-980-01-1107-59, [1959] 19p. 26 refs. AD-231 392.
Order from LC mi$2.40, ph$3.30 PB 145 951

Scattered intensities from bovine serum albumin in solution were studied at several temperatures in the vicinity of its isoionic point and in the presence of sodium chloride. The extraneous salt concentration dependence of second virial coefficient A_2 was discussed in terms of the theory of Edsall et al. (J. Am. Chem. Soc. 68:2315, 1946) and the protein-protein interaction term β_{22} was estimated from the observed data.

University of Southern California. School of Medicine, Los Angeles.
TESTOSTERONE-INDUCED N-RETENTION IN CASTRATED RATS ON DIETS CONTAINING INCOMPLETE PROTEINS, by M. E. Nimni and E. Geiger. Rept. on Contract AF 18(600)549. Oct 57, 8p. 9 refs. Technical note AAL-TN-57-28; AD-230 836.
Order from LC mi$1.80, ph$1.80 PB 146 240

Testosterone propionate treatment increased the nitrogen retention of castrated adult male rats even when the diet contained zein or gelatin as the only nitrogen sources, compounds which do not support protein synthesis because of their lack of some essential amino acids. A slight shift to positive nitrogen balance has been observed in TP-treated rats which received, as their only nitrogen source, a mixture of 3 non-essential amino acids. The results, therefore, seem to suggest that TP-induced nitrogen retention does not necessarily indicate an increase of tissue protein synthesis.

Armed Services Technical Information Agency, Arlington, Va.
BIO-ASTRONAUTICS, SUPPLEMENT. Report Bibliography. Feb 60, 49p. 248 refs. AD-233 000.
Order from OTS $1.25 PB 161 653

Previous bibliographies have covered the literature on bio-astronautics through 1958. This supplemental bibliography brings the subject matter up to date through 1959 insofar as report literature, represented by ASTIA holdings, is concerned. (Author) (See also PB 151 853)

Army Prosthetics Research Lab., Washington, D. C.
COMPARISON OF STAIN RESISTANCES OF VINYL MATERIAL DETERMINED BY THE SPECTROPHOTOMETER AND COLOR-DIFFERENCE METER, by James Hill and William Wiedmann. 3 Feb 59, 4p. 2 refs. Technical rept. no. 5904.
Order from LC mi$1.80, ph$1.80 PB 145 705

Stain resistance values were calculated and results compared.

National Bureau of Standards, Washington, D. C.
ANALOG-DIGITAL CONVERSION EQUIPMENT FOR ELECTROCARDIOGRAPHIC DATA, by L. Taback. Apr 60, 46p. Technical note 42.
Order from OTS $1.25 PB 151 401

A corrected orthogonal 3-lead system has been used to record electrocardiograms directly from patients at Veterans Hospitals, using three FM channels of magnetic tape. A pilot facility has been designed and assembled by NBS to permit a medical technician to inspect these on an oscilloscope and select a significant cardiac cycle. This is automatically sampled at millisecond intervals and the numerical values are stored in digital form on magnetic tape acceptable to an electronic computer. Upon writing various programs for the digital computer, the cardiac researcher will have a flexible tool for objective analysis of large quantities of biological data by a variety of possible criteria. (Author)

School of Aviation Medicine, Brooks AFB, Tex.
RESTORATIVE DENTISTRY WORKLOAD OF THE USAF DENTAL SERVICE, by Lucian Szmyd and Clarence M. McCall, Jr. Jan 60, 7p. 5 refs. Rept. 60-27; AD-232 648.
Order from LC mi$1.80, ph$1.80 PB 146 145

This analysis indicates that the system of allocating dental resources on the basis of total number of personnel assigned is complicated by personnel turnover, and by the restorative dental problem of incoming basics and overseas dependents.

Microbiology

Army Chemical [Corps] Fort Detrick, Md.
MONKEY B VIRUS: A REVIEW OF THE LITERATURE, by William T. Soper. Aug 59, 26p. 35 refs. BWL Technical Study 17. AD-229 993.
Order from LC mi$2.70, ph$4.80 PB 145 874

The content of this report deals with the original observations of Dr. Albert Sabin on infection of man with B virus and continues with accounts of other known infections. Diagnostic methods for isolation and identification of the virus in monkeys and man are included. The growth and action of the virus in various host tissues and it's physical and chemical properties are discussed.

Karolinska Institutet, Stockholm (Sweden).
CONTINUED STUDIES ON THE INFLUENCE OF CULTIVATION TECHNIQUES ON THE ANTIGENIC CHARACTER OF BACTERIA, by C. -G. Heden. Final technical rept. for Nov 58-Nov 59 on Contract DA 91-591-EUC-947-01-1058-59. [1959] 24p. 18 refs. AD-231 369.
Order from LC mi$2.70, ph$4.80 PB 146 205

H. pertussis was grown under pilot plant conditions and the cells were broken up and extracted. The two basic fractions were the soluble components obtained by extraction and the sedimentable portion which proved to consist of cellwalls which could be tested in the form of a lyophilic colloid. The extract contained both a neurotoxic and a dermatonecrotic component which could be roughly separated by physicochemical techniques. None of the nucleic acid or protein fractions isolated from the bacterial extracts were immunogenic. On the other hand the sedimentable portion proved to be an excellent immunogen with almost no toxicity. It is unfortunate that the immunogen of H. pertussis to such a large extent is associated with, or identical with cellwall fragments. A fact which makes the originally planned study of the yields as a function of the growth phase difficult or impossible to perform.

Parke, Davis and Co., Detroit, Mich.
INVESTIGATION OF COMBINED BACTERIAL VACCINES AND TOXOIDS, by H. B. Devlin, Ida Nemer, and Betty Carpenter. Final rept. for 20 May 55-28 Feb 58. [1958] 53p. 35 refs. AD-200 842.
Order from LC mi$3.60, ph$9.30 PB 145 828

The work was to determine whether it was immunologically practical to combine a large number of bacterial vaccines and toxoids in one preparation for inoculation of man. Small laboratory animals were suggested for these preliminary experiments in which an attempt would be made to combine a minimum of five and a maximum of ten antigens. The scope of work included the study of "non-biological" adjuvants such as aluminum gels and mineral oil to improve the protective capacity of the product. Immunogenic activities were to be compared by determining the titers of antibodies produced in the serum or the degree of protection conferred against a toxic or infectious challenge. The results of the work are given.

Pathology

Avco Corp., Wilmington, Mass.
STUDY OF TECHNIQUE FOR DIAGNOSING EARLY PROGRESSIVE PULMONARY DISEASE; FINAL REPORT. 21 Dec 59, 49p. Technical rept. RAD-TR-59-38.
Order from LC mi$3.30, ph$7.80 PB 145 827

The results of a study to determine the feasibility of correlating respiratory sounds with pathological changes in the lungs by means of analysis of the frequency and amplitude variances during respiration are presented.

Cologne U. (Germany).
SELFINTOXICATION OF THE ORGANISM IN (ADVANCED) RENAL AND HEPATIC INSUFFICIENCY, by Fr. Franzen. Annual rept. (Final technical) for 1 Aug 57-31 Aug 59 on Contract DA 91-508-EUC-252. [1959] 185p. AD-230 072.
Order from LC mi$8.40, ph$28.80 PB 146 198

The following investigations were carried out: (1) the influence of body-own proteinogenic amines on the renal function, tested by means of the clearance method on dogs: (2) clearance of electrolytes (Na, K, and Cl); (3) the influence of body-own proteinogenic amines on the renal function tested in diuresis experiments on hydrated rats; (4) the influence of body-own proteinogenic amines on the diuresis of rats after previous gift of an aminoxydase-blocker (Iproniacid); (5) determination of proteinogenic amines in blood and urine of patients suffering from renal and hepatic diseases; (6) the influence of body-own proteinogenic amines on change of gas, body-weight, blood-sugar, and body temperature of rats and rabbits, respectively.

Pharmacology and Toxicology

Army Chemical Corps., Fort Detrick, Md.
THE LABORATORY PRODUCTION OF GONYAULAX CATANELLA POISON, by Lloyd H. Graf, Mabel J. Thacher, and Carl R. Brewer. Rept. for Apr 51-Mar 52. 6 Nov 52, 44p. 4 refs. Special rept. no. 174.
Order from LC mi$3.30, ph$7.80 PB 145 875

The investigations described in this report were under taken with the objective of providing a reliable source of G catanella poison in order that chemical characterization might proceed without interruption caused by failure of the natural sources. Attempts were made to increase poison yields by systematic studies on nutrition and incubation conditions affecting G catanella.

Army Chemical Warfare Labs., Army Chemical Center, Md.
EFFECTS OF STRUCTURAL VARIATIONS IN SYSTOX AND ISOSYSTOX ANALOGS ON THEIR

REACTIONS WITH CHOLINESTERASE, by Frederick W. Hoffman, James W. King and Harry O. Michel. Rept. for Sep 57-Feb 59. Nov 59, 11p. 9 refs. CWLR-2325, AD-230 382.
Order from LC mi$2.40, ph$3.30 PB 146 251

The effect of variation of the alkoxy group (R') in the series of Systox and Isosystox analogs of the types (RP(S)(OR') $OCH_2CH_2SC_2H_5$(I) and RP(O)(OR')$SCH_2CH_2SC_2H_5$(II), respectively, was investigated for the compounds with R being CH_3 and C_2H_5. The thiono compounds of type I were prepared by the reaction of the appropriate chloridothioates, RP(S)(OR')Cl, with the sodium derivative of 2-ethylthioethanol, and the resulting compounds I isomerized thermally to the thiolo derivatives II. The rates of the inactivation of cholinesterase by I at pH 7.4 and 25° are all small compared to those of the II which show, with increasing chain length of the R' group, increasing velocity constants. (Author)

[Army Chemical Warfare] Labs., Army Chemical Center, Md.
METHODS FOR QUANTITATIVE DETERMINATION OF GB ABSORBED FROM INSPIRED AIR OF MAN DURING REST AND EXERCISE, by Fred W. Oberst, William S. Koon and James W. Crook. Oct 52, declassified 30 Mar 59, 29p. 9 refs. Medical Labs. Research rept. no. 143.
Order from LC mi$2.70, ph$4.80 PB 146 249

A method was developed for the quantitative determination of GB absorbed from inspired air of man during rest and exercise. A subject inspired orally a known concentration of GB (GB=fluoroisopropoxymethyl phosphine oxide) vapor and exhaled it into a Kel-F bag, the concentration was determined by analysis. The amount of GB retained in the body was calculated. To increase the minute volume of respired air the subject performed work on an ergometer. The amount of GB retained (dosage) for a two minute inhalation period in a man at rest varied between 6 and 13 mmg. During inhalation of a comparable concentration exercise increased the amount retained to 24-82 mmg. (Author)

Radiobiology

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
INFLUENCE OF DIETARY CYSTEINE UPON THE EFFECTS OF CONTINUOUS LOW-LEVEL IRRADIATION, by R. L. Preston and A. Hellman. Rept. on Physiology of Flight. Dec 59, 18p. 15 refs. WADC Technical note 59-190.
Order from OTS $0.50 PB 161 655

Continuous gamma radiation (38.6 and 76.8 roentgens/week given in 8- and 16-hour periods/day, respectively) was administered for 6 weeks to 9 growing rats/radiation level. These were compared to 9 controls. Within these 3 groups, 3 levels of cysteine (0%, 0.4%, and 1.6% of total diet) were individually fed in a factorial experiment to determine if this compound in the daily diet would alleviate the effects of continuous irradiation. Adverse effects on a number of physiological variables caused by the irradiation were not alleviated by the administration of this compound. In fact, certain criteria were affected to a greater degree when the animals were fed the high level of cysteine (reduced body growth, feed consumption and efficiency, and thymus and spleen weights). (Author)

Albert Einstein Medical Center, Philadelphia, Pa.
THE METABOLISM OF THE RADIATION PROTECTIVE AGENT 2-AMINO-ETHYLISOTHIURONIUM BROMIDE HYDROBROMIDE IN MICE AND ITS ALTERATION BY RADIATION, by Bernard Shapiro. Dec 59, 13p. 8 refs. AFSAM 59-30; AD-231 617.
Order from LC mi$2.40, ph$3.30 PB 146 188

These experiments were designed to separate the various metabolic forms which appear in the mouse after intraperitoneal injection of AET 2-aminoethylisothiuronium bromide hydrobromide (AET) and to measure the changes in these forms induced by radiation. S-35 labeled AET, paper chromatography, and paper electrophoresis were utilized in making these analyses.

Albert Einstein Medical Center, Philadelphia, Pa.
PROTEIN BINDING OF AET AND ITS ALTERATION BY IONIZING RADIATION, by E. Anne Dickens and Bernard Shapiro. Jan 60, 12p. 7 refs. AFSAM 60-2.
Order from LC mi$2.40, ph$3.30 PB 146 190

Previous reports have described investigations of the behavior of the radiation protective agent, S-(2-aminoethyl) thiuronium bromide hydrobromide (AET) in aqueous buffered solutions (1, 2) and in human serum (3). In aqueous buffered solutions AET underwent transguanylation to form 2-mercaptoethylguanidine (MEG) and its disulfide, guanidoethyl disulfide (GED). In 10^{-3} M solutions of sulfur-35-labeled AET in human serum, 30 to 45 percent of the radioactivity was bound to the serum proteins. The amount of binding did not appear to change appreciably when the serum was allowed to stand at room temperature or when it was exposed to a dose of 240,000 rep from a cobalt-60 gamma ray source. After doses of 1,000,000 rep, however, it was noted that the amount of radioactivity bound to the serum proteins increased. Since radiation protection may be effected by a protein-bound form of the protective agent (4, 5), it seemed that a further investigation of protein binding and its alteration by radiation should be made. A detailed study of the interaction between MEG-GED mixtures and various proteins in solution and of the effect of irradiation upon their interaction is herein reported.

Battelle Memorial Inst., Columbus, Ohio.
THE EFFECTS OF RADIATION ON OXYGEN DESIGNED FOR HUMAN CONSUMPTION, by John F Kircher, Justin S. McNulty and others. Rept. on Health Hazards of Materials and Radiation, Contract AF 33(616)5659. Dec 59, 37p. 24 refs. WADC Technical rept. 59-618.
Order from OTS $1.00 PB 161 551

Both liquid and gaseous aviator's breathing oxygen, contained under controlled pressure and temperature in stainless steel vessels, were subjected to gamma irradiation. The rate of ozone formation in liquid oxygen was nearly constant to 5.9×10^8 ergs $g.^{-1}$ (C), the maximum dose used in these studies. Ozone formed during irradiation of gaseous oxygen, reached a maximum concentration at about 3×10^7 ergs $g.^{-1}$(C) and decreased to an equilibrium concentration at about 10^9 ergs $g.^{-1}$(C). The ozone yield appeared to be independent of pressure and dependent upon temperature and dose rate. There were marked increases in the ozone yield with decreasing temperature and with increasing dose rate. In mixed-field irradiations, induced radioactivity due to argon-41 was found. The equilibrium activity was 10 to 14×10^{-5} microcuries per c.c. (Author)

[Defense Atomic Support Agency] Washington, D. C.
MILITARY ASPECTS OF THE BIOLOGICAL EFFECTS OF RADIATION, by Nathaniel I. Berlin.
9 Nov 56, declassified 24 July 57, 58p. 67 refs.
AFSWP-611; AD-212 721.
Order from LC mi$3.60, ph$9.30 PB 146 481

This study has been prepared as a review of some military aspects of radiobiology. Particular attention has been paid to the dosimetric considerations and the quantitation of biological effect. Wherever possible, areas of controversy have been reviewed and evaluated. (Author)

Naval Radiological Defense Lab., San Francisco, Calif.
A PROGRAM FOR THE EVALUATION OF THE EFFICIENCY OF RESPIRATORY PROTECTIVE DEVICES AGAINST RADIOACTIVE SUBSTANCES, by F. R. Holden. Interim rept. 26 Sep 49, declassified, 7p. 2 refs. AD-165(H).
Order from LC mi$1.80, ph$1.80 PB 146 855

A program for the evaluation of the effieiency of respiratory protective devices against radioactive substances is outlined. Radon decay products and radioactive dusts of controlled particle size will be used to measure filtration efficiencies of military and industrial protective equipment. The chambers in which the studies will be made are described. (Author)

Public Health Service, Washington, D. C.
RADIOLOGICAL HEALTH DATA. Monthly rept.
Apr 60, 48p. 12 refs.
Order from OTS $0.50, $3.00/6 mos. PB 161 371-1

Contents:
Interpretations of radiation levels
Milk
Description of public health service milk monitoring program
Public health service data on radioactivity in milk (November 1959)
Atomic Energy Commission data on radioactivity in milk
State of Minnesota milk data
A selected list of environmental sampling networks for analysis of radioactivity in milk
Milk networks - methods of publication of data
Milk networks - list of sampling stations

School of Aviation Medicine, Brooks AFB, Tex.
SOME EVIDENCE SUGGESTING THE PERCEPTION OF MODERATE-INTENSITY RADIATION AMONG ALBINO RATS, by Loren C. Logie, W. Lynn Brown (Radiobiological Lab., U. of Texas) and others.
Sep 59, 6p. 3 refs. Rept. 60-5.
Order from LC mi$1.80, ph$1.80 PB 146 147

Two experiments designed to test the hypothesis that albino rats perceive x-radiation as a noxious stimulus are reported. Each experiment involved two conditions which were exactly alike except for the location of a protective lead shield. For half of the Ss, the lead shield was located in front of the right-hand compartment of the shuttle-boxes; for the other half, the lead shield was located in front of the left-hand compartment. In each experiment the results suggested that radiation, or its immediate consequence, was perceived by the rats; however, in each experiment the observed effect was very moderate. (Author)

USAF Radiation Lab., U. of Chicago, Ill.
RADIATION AND SUSCEPTIBILITY TO INFECTION: A LITERATURE SURVEY, by Robert D. Boche.
Special rept. on Contract AF 33(038)27353. [1954]
67p. 269 refs. AD-108 849.
Order from LC mi$3.90, ph$10.80 PB 146 480

Radiation exposure of animals with amounts of ionizing radiations in the LD-50 range produces radiation illness and death characterized by invasion of the bloodstream and tissues by bacteria from the intestine. The mechanism by which the bacteria invade the blood stream is unknown. The organisms recovered from irradiated animals are found to be those characteristic of the species. Latent infections are activated by radiation and the rate of spread of infections is increased by irradiation. Human exposures are often characterized by infectious processes after the second week post-irradiation, a fact in agreement with animal experience. The susceptibility of laboratory animals to induced infection is usually increased by moderate or large doses of radiation. Radiation decreases the cellular elements of the blood and in mice the depression of the white blood cell count like that of the resistance has been found to be exponentially related to radiation dose. Increase in phagocytosis by leukocytes of the blood and by the cells of the liver and spleen is observed after radiation. Destruction of lymphocytes by x-radiation does not increase antibody content of the blood or lymph. Antibiotics reduce both the incidence of infection and the mortality in laboratory animals given radiation exposure providing the invading organisms are susceptible to the antibiotic. The localization of the effect of radiation exposure on antibody production to within a few hours of antigen administration is a notable advance in our knowledge of the immune process.

CHEMISTRY

Analytical Chemistry

Army Chemical Warfare Labs., Army Chemical Center, Md.
PRELIMINARY MODEL ROTATING FILTER WHEEL LOPAIR (LONG PATH INFRARED) INSTRUMENT, by Arnold Prostak. 3 Nov 58, 16p. 5 refs. CWL Technical memo. 32-37; AD-207 510.
Order from LC mi$2.40, ph$3.30 PB 146 858

A relatively simple instrument has been built to detect small quantities of contaminants in the air by means of their infrared absorption at a specified wavelength. A rotating filter wheel was used to chop the radiation and provide wavelength selectivity. (Author)

Bell Aircraft Corp., Buffalo, N. Y.
INVESTIGATION OF FUMING NITRIC ACID CONTAMINANTS, by D. Fulmer. Final rept. for 8 Apr 57-30 Sep 58 on Contract DA 18-108-cml-6308. 31 Oct 58, 100p. 5 refs. Rept. no. 8002-981-017; AD-208 452.
Order from LC mi$5.40, ph$15.30 PB 145 906

A whole series of experiments were performed, using containers of various capacities and of various aluminum alloy compositions. Variables included temperature, time, exposure to the atmosphere or fully enclosed with no access to the air. Many series of analyses were performed on the solid contaminants, gaseous products and dissolved materials. Other related studies were undertaken.

Louisiana State U., Baton Rouge.
COLOR REACTIONS FOR INORGANIC ANALYSIS, by Philip W. West. Final rept. on Contract DA 01-009-ORD-460. 1 Mar 59, 51p. 5 refs. OOR rept. 350.15C; AD-213 326.
Order from OTS $1.50 PB 161 544

A variety of color reactions have been studied for inorganic analysis. The studies were directed along two different lines. One phase of the research program was directed toward the development of color reactions that could be applied to nonaqueous systems, especially those associated with solvent extraction separations. The second phase of the program dealt with general studies of colorimetric analysis. Two contributions of special interest have resulted from the program. One is the development of a rapid, simple and reliable scheme for the microanalysis of complex mixtures using only a single drop of solution. The scheme permits the separation and identification of over thirty ions in total time of approximately thirty to forty minutes. The second major contribution has been the development of a highly selective and accurate direct spectrophotometric method for the estimation of chloride. The method is more accurate than any known titrimetric procedure for small amounts of chloride and is free from interferences, even from other halides.

New Mexico Highlands U., Las Vegas.
THE BEHAVIOR OF SOME NIOBIUM(V)-HALIDE COMPLEXES IN AQUEOUS MEDIA, by James H. Kanzelmeyer, B. M. Procter, and Patricia Mack. Final rept. on Contract Nonr-1839(00). 27 May 59, 53p. 6 refs.
Order from LC mi$3.60, ph$9.30 PB 145 745

Evidence has been presented that conflicts with the previously accepted $NbOF_5^{=}$ ions postulated for potassium fluoniobate. This salt, dissolved in water, acts as a moderately strong acid reacting with four hydroxides per niobium to form a soluble niobate, a reaction which appears to be both reversible and rapid. A structure has been proposed that takes into consideration these observations and also accounts for the measured conductance of the solutions. The ionic structure consists of two niobium (V) atoms held together by an oxo linkage. Each niobium is covalently linked to five fluorides and one hydroxyl. Eight of the fluorides are comparatively labile, but one on each niobium is hydrogen-bonded to the hydroxyl on the other niobium. (Author)

Organic Chemistry

Aeronautical Research Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
UREA INCLUSION COMPOUNDS OF ACETYLENE DERIVATIVES, by Jack Radell, Joseph W. Connolly, and Louis D. Yuhas. Feb 60, 13p. 11 refs. WADC Technical rept. 59-672.
Order from OTS $0.50 PB 161 686

Urea inclusion compounds of several acetylene derivatives have been prepared. In the monalkyl and dialkyl acetylenes, the effect of the acetylene group increased the over-all cross-sectional diameter of the molecule. The ability of the acetylenic molecules to form a urea inclusion compound is a function of the number of consecutive $-CH_2-$groups and the over-all cross-sectional diameter of the molecule. The relative stability of the urea inclusion compounds of a series of position isomers of nonyne or decyne depends on the cross-sectional diameter of the molecule. (Author)

Atlantic Research Corp., Alexandria, Va.
THE THERMAL DECOMPOSITION OF 2, 2'-AZOISOBUTANE, by Joseph B. Levy and B. K. W. Copeland. Rept. on Contract AF 49(638)483. Jan 60, 19p. 17 refs. AFOSR-TN-60-161; AD-232 818.
Order from LC mi$2.40, ph$3.30 PB 145 838

The thermal decomposition of gaseous 2, 2'-azoisobutane has been studied over the temperature range 180-220°. The principal reaction products were isobutane and nitrogen. Mirror removal experiments were carried out with antimony mirrors and the lifetime of the t-butyl radical determined. The radical was found to have a substantially longer life than methyl radical. The significance of these results is discussed and a mechanism for the reaction proposed.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
DILUTE SOLUTION PROPERTIES OF POLY(2-ETHYLBUTYL METHACRYLATE) by Frank E. Didot and David W. Levi. Mar 60, 35p. 22 refs. Technical rept. 2676.
Order from LC mi$3.00, ph$6.30 PB 144 827

Florida U. Engineering and Industrial Experiment Station, Gainesville, Fla.
THERMALLY STABLE POLYMERS FROM CONDENSATION POLYMERIZATION OF PERFLUOROALKYL AMIDINES, by Henry C. Brown. Technical rept. on Contract Nonr-580(03). 1 May 59, 54p. 5 refs.
Order from LC mi$3.60, ph$9.30 PB 145 901

This report describes the preparation of new, thermally stable polymers from homopolymerization of perfluoroglutarimidine and perfluoroadipodiamidine and from the copolymerization of perfluoroglutarimidine, perfluorosuccinimidine and perfluoroadipodiamidine with a variety of perfluoroalkyl monoamidines. These polymer products range in physical characteristics from hard solids to elastomeric gums to viscous liquids. All of the polymers are stable in air at 350°C. for extended periods and resist attack by strong oxidizing mineral acids at elevated temperatures. (Author)

Harvard U., Cambridge, Mass.
PREPARATION AND STUDY OF SOME PERFLUOROALKYL COMPOUNDS OF TIN AND LEAD [AND] SYNTHESIS AND CLEAVAGE OF PERFLUOROVINYLTIN COMPOUNDS, by F. G. A. Stone, H. D. Kaesz and others. Rept. on Contract AF 49(638)518. Apr 60, 30p. 35 refs. AFOSR-TN-60-273-274.
Order from LC mi$2.70, ph$4.80 PB 146 765

Leicester U. (Gt. Brit.)
ARYLSILANES AND AROMATIC REACTIVITY, by J. A. Sperry. Annual technical rept. for 1 Jan-31 Dec 59 on Contract DA 91-591-EUC-1024. [1960] 10p. 43 refs.
Order from LC mi$1.80, ph$1.80 PB 145 953

Trimethylsilyl derivatives (mainly new) of benzothiophene, dibenzothiophene, dibenzofuran, N-ethylcarbazole, diphenyl ether diphenylsulphide, diphenylmethane, fluorene, and pyrene have been prepared and studied.

Louisiana Polytechnic Inst. [Ruston.]
THE RLi-INDUCED RING CLOSURE OF TRITYL METHYL ETHER, by J. W. Morton, Jr., W. C. Culp and others. Final rept. for 23 Oct 57-22 Oct 59 on Contract DA 01-009-ORD-585. [1959] 23p. 7 refs. OOR rept. no. 1895. 1-C; AD-231 797.
Order from LC mi$2.70, ph$4.80 PB 145 905

Two mechanisms for the reaction of trityl methyl ether with RLi compounds were investigated in which the reaction yields 9-phenyl-9-fluorenyllithium. In one mechanism, the trityl ether undergoes an ortho metalation, yielding a lithio derivative whose carbanion portion attacks an ortho position of another phenyl group, with the expulsion of methoxide and the formation of a quinoidisomer of 9-phenylfluorene. The latter is then converted into the final lithio derivative by the action of excess RLi. In the second mechanism, the ether, after undergoing ortho metalation, yields a ring closure product, 9-phenyl-9-fluorenyl methylether, by hydride elimination. The fluorenyl ether then yields the final product, either through lateral metalation followed by the elimination of formaldehyde, or through some other mode of reductive cleavage. There is experimental evidence for the ortho metalation which is postulated in both mechanisms. Experimental data agreed well in ruling out the second mechanism as important in the ring closure reaction.

Naval Ordnance Lab., White Oak, Md.
THE TEMPERATURE AND ACTIVATION ENERGY OF ELECTRICAL CONDUCTION IN HIGH POLYMERS, by R. W. Warfield and M. C. Petree. 19 Sep 58, 17p. 19 refs. NAVORD Rept. 6246; AD-212 622.
Order from LC mi$2.40, ph$3.30 PB 145 826

The temperature dependence of the electrical resistivity of a number of high polymers has been determined. By means of an Arrhenius plot, the activation energy for the conduction process in these polymers has been calculated and the results have been interpreted in terms of an ionic diffusion process. The activation energy for the conduction process appears to be a very sensitive index of the extent of polymerization. (Author)

Quartermaster Research and Engineering Center, Natick, Mass.
IRRADIATION "FACTOR-DEPENDENCY": SOME VINYL MONOMERS, by Ed. F. Degering, G. J. Caldarella, and M. Mancini. Dec 59, 42p. 5 refs. Radiation Chemistry Lab. Series Research rept. no. 2.
Order from LC mi$3.30, ph$7.80 PB 145 895

Data are given which confirm the observations on the irradiation-induced polymerization of styrene, with respect to the effect of various combinations of parameters. The formulation of Polymerization Rate = $kI^{1/2}$, is not applicable to the dose rates encountered with a 1.5 Mev or higher electron accelerator. The E-value (modified "G_e"-value), or the amount of polymer formation per unit of irradiation energy, increases significantly with a decrease in dose rate down to some optimum value. There is a non-additivity of dose, that is, five exposures at a given dose rate is not equivalent to five times the effect obtained by one exposure at the same dose rate. There is, in certain monomer systems, an "apparent" variation of effects as a function of irradiation parameters, that is, a graph approximating a sloping sinusoidal-type of curve may be obtained for acrylonitrile at least if the per cent yield of polymer is plotted as a function of total dose, provided the points represent also increasing dose rates. Irradiation-induced polymerization-rate has no apparent significance except for a very specifically defined set of irradiation parameters. The results suggest the need

for both extensive and intensive fundamental research in other areas dealing with the applications of ionizing radiation in order to define more accurately the significance of irradiation parameters.

Schmid, Hermann.
THE MECHANISM OF THE DIAZOTIZATION OF AROMATIC AMINES IN NON AQUEOUS SOLVENTS, by Hermann Schmid. Annual technical rept. for 1 Dec 58-30 Nov 59 on Contract DA 91-591-EUC-1010. [1959] 27p. 37 refs.
Order from LC mi$2.70, ph$4.80 PB 145 955

This investigation has been undertaken in the purpose to throw more light on the reaction of the diazotization of amines in organic solvents.

Textile Research Inst., Princeton, N. J.
AN ANALYSIS AND INTERPRETATION OF POLYMER STRESS RELAXATION DATA, by Richard E. Heitman. Technical rept. no. 18 on Contracts Nonr-09000 and Nonr-09001. May 59, 220p. 57 refs. AD-220 739.
Order from LC mi$9.60, ph$33.30 PB 145 903

The relation between the stress relaxation of a polymer sample, pre-stressed below the yield point, and the diffusivity of the reagent which induces the relaxation was established by (1) proposing a theory for the molecular behavior of polymers during stress relaxation in various media (equations which relate force and polymer properties to time were derived); (2) developing experimental and analytical procedures to provide the information necessary to test the theory; and (3) comparing the results obtained from an experimental investigation of the behavior of drawn nylon when it was relaxed in water with data obtained from independent sources. The theory of polymer behavior predicts that the stress relaxation process can, generally, be interpreted to be the result of a series of component relaxations which may, or may not, be related. A new mathematical method is presented by which longitudinal swelling, force constant decay, and chemical reaction can be separated. A continuation of the mathematical development yielded a relationship between the mass of reagent which has entered a relaxing sample at any time and the force level at that time. This method can only be used to determine the diffusivity within a range of values dependent upon the difference of water concentrations in the fiber between the conditioned and relaxed state.

Università degli Studi di Trieste (Italy)
FURTHER STUDIES ON CHEMICAL BEHAVIOUR AND REACTIVITY OF LABILE METAL-ORGANIC COMPOUNDS. Final technical rept. for 1 Jan-31 Dec 59 on Contract DA 91-591-EUC-1015. Jan 60, 57p. 23 refs.
Order from LC mi$3.60, ph$9.30 PB 145 948

Thermal decomposition of $CuCH_3$ in CH_3OH is studied when $Pb(CH_3)_4$ is present. The infrared spectrum of $2AgCD_3 \cdot AgNO_3$ was obtained and studied. The reactivity of copper-methyl towards foreign substances has been studied.

Physical Chemistry

Armour Research Foundation, Chicago, Ill.
AUTOMATIC COUNTING AND SIZING OF AEROSOL PARTICLES, by Sidney Katz and A. Lieberman. Final rept. on Contract DA 18-064-cml-1904. 20 Nov 53, declassified, 166p. 16 refs.
Order from LC mi$7.80, ph$25.80 PB 145 712

This report describes the design and operation of a device for the automatic counting and sizing of aerosol particles in sizes between 1 and 60μ and in particle concentrations up to 10,000/ml. This report describes the construction of two instruments and discusses fully operating procedures, instrument errors, and instrument performance.

Bonn U. (West Germany).
PHOTOCHEMICAL FORMATION AND THE PHOTOLYSIS OF NITROUS OXIDE IN THE EXTREME ULTRAVIOLET, I. PHOTOCHEMICAL FORMATION OF ORGANIC COMPOUNDS FROM MIXTURES OF SIMPLE GASES, II. INTENSE LIGHT SOURCES FOR THE VACUUM ULTRAVIOLET, III, by H. Schierholz, H. v. Weyssenhoff, and others. Technical rept. no. 1 for July 56-Mar 59 on Contract AF 61(514)1079. [1959] 72p. 12 refs. AFCRC-TN-59-421; AD-217 824.
Order from LC mi$4.50, ph$12.30 PB 145 848

Brush Beryllium Co. [Cleveland, Ohio.]
AN INVESTIGATION OF INTERMETALLIC COMPOUNDS FOR VERY HIGH TEMPERATURE APPLICATIONS, by Robert M. Paine, A. James Stonehouse, and Wallace W. Beaver. Rept. for 13 Mar 56-12 Mar 57 on AEC-ANP Materials Research, Contracts AF 33(616)56-12 and AT(30-1)541. Jan 60, 247p. 603 refs. WADC Technical rept. 59-29, Pt. 1.
Order from OTS $3.50 PB 161 683

Intermetallic compounds from thirty-five binary metallic systems were prepared, fabricated into oxidation-test specimens, and tested for oxidation resistance in dry air at 2300°F. Only high-melting (above 2550°F) compounds were studied. These included aluminides, beryllides, silicides, germanides, and zirconides, as well as numerous miscellaneous compounds. The intermetallic compounds or compositions which are shown to have sufficient oxidation resistance at 2300°F to be potentially useful at this temperature include: $NbAl_3$, $TaAl_3$, $CrBe_2$, $MoBe_{12}$, Nb_2Be_{17}, $NbBe_{12}$, $TaBe_2$, Ta_2Be_{17}, $TaBe_{12}$, $TiBe_2$, $TiBe_{12}$, "WBe_5", $ZrBe_{13}$, Zr_2Be_{17}, Cr_3Si, Ti_5Si_3, "TiSi", $TiSi_2$, and $TaCr_2$. A literature survey of intermetallic compounds is included. (Author)

Calvin Coll., Grand Rapids, Mich.
THE OXIDATION OF THE SILVER ELECTRODE IN ALKALINE SOLUTIONS, by Thedford P. Dirkse. Technical rept. no. 8 on Contract Nonr-1682(01). 1 May 59, 26p. 16 refs.
Order from LC mi$2.70, ph$4.80 PB 145 898

The formation of Ag_2O and AgO was studied by means of constant current and constant potential processes. The efficiency of these oxide formations was determined by measuring the gain in weight of Ag electrodes under various conditions of charge, and the extent of the polarization of these processes was measured by using an interrupted current technique. (Author)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
A STUDY OF THE SOLUBILITY AND RATE OF SOLUTION OF FINE AEROSOL PARTICLES, by Clyde Orr, Jr.; F. Kenneth Hurd and others. Final rept. on Contract AF 19(604)1970. 28 Feb 59, 68p. 9 refs. AFCRC-TN-59-281; AD-232 256.
Order from LC mi$3.90, ph$10.80 PB 145 847

The purpose of this research was (1) to determine equilibrium solubilities for PbI_2 and AgI in water at several temperatures, (2) to investigate the rate of dissolution of the same compounds under laboratory conditions, and (3) to determine if the experimental results could have been predicted from previously existing physical data.

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
RADIANT ENERGY TRANSFER FROM NONISOTHERMAL MOLECULAR EMITTERS WITH NONOVERLAPPING DISPERSION LINES, by D. Olfe. Technical rept. no. 31 on Contract Nonr-220(03). Apr 59, 16p. 4 refs. AD-218 331.
Order from LC mi$2.40, ph$3.30 PB 145 941

This study on non-overlapping dispersion lines complements earlier work done on overlapping lines and on randomly distributed dispersion lines. Starting with the general relation for the radiant energy flux from a nonisothermal gas, the transparent gas approximation is described for gases of small optical depth. Next the square root approximation is worked out for gases of large optical depth. The result for large optical depths applies provided the temperature gradient in the slab of gas nearest to the observer is not too large. The square root approximation was also used to derive an explicit expression for the radiant energy flux from two adjacent isothermal regions with the hotter gases viewed through the gases which are at lower temperature. (Author)

Harvard U., Cambridge, Mass.
STUDIES IN ELECTRONEGATIVITY, by A. L. Alfred. Doctoral thesis. Technical rept. on Contract Nonr-1866(13). Sep 57, 71p. 63 refs. AD-142 420.
Order from LC mi$4.50, ph$12.30 PB 146 156

A scale of electronegativity based on electrostatic force
The nuclear magnetic resonance absorption of hydrogen in methyl groups. The electronegativity of substituents
Electronegativities of carbon, silicon, germanium, tin and lead

Institute for the Study of Metals, U. of Chicago, Ill.
DIFFUSION IN SOLIDS AND LIQUIDS AND THE PROPERTIES OF SUBSTANCES AT HIGH TEMPERATURES (1) POINT IMPERFECTIONS IN METALS BY CONDUCTIVITY AND DIFFUSION MEASUREMENTS (2) OPTICAL PROPERTIES OF METALS (3) by Norman H. Nachtrieb, Carl T. Tomizuka, and LeRoy G. Schulz. Final rept. on Contract AF 18(600)1489. [1957] 188p. 80 refs. AFOSR-TR-60-23.
Order from LC mi$8.40, ph$28.80 PB 145 836

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
COMBUSTION IN LAMINAR MIXING REGIONS AND BOUNDARY LAYERS, by Donald Allen Dooley, Doctoral thesis. Rept. on Contract DA 04-495-ORD-18. 1 June 56, 264p. 79 refs. Memo. no. 20-151; AD-153 464.
Order from LC mi$11.10, ph$41.10 PB 145 888

The governing relations for gaseous flow systems with chemical reaction are briefly discussed. One-step unopposed, "global" reactions following first-order, second-order, and third-order kinetics are considered. The analytic techniques developed are applied to the problems of combustion within laminar mixing regions and boundary layers. The application of the similarity techniques to the problem of chemical reaction within a hypersonic boundary layer is briefly discussed in an Appendix.

Linfield Research Inst., McMinnville, Oreg.
RESEARCH ON ELECTROLYTIC MICROMACHINING TECHNIQUES OF REFRACTORY METALS FOR USE IN FIELD EMISSION DEVICES, by H. W. Pitman and D. C. Hamby. Quarterly progress rept. no. 3, 15 Jan-15 Apr 59, on Contract DA 36-039-sc-78191. [1959] 34p. 7 refs.
Order from LC mi$3.00, ph$6.30 PB 146 496

Evaluation of methods for determining the thickness of thin anodically formed oxide films on tungsten metal has led to the conclusion that the combined use of the coulometric and reflectance methods will yield the most accurate information on film thickness and forming fields. An approach to the calculation of the properties of anodically formed oxide films from coulometric and optical interference data is presented. (See also PB 142 704)

Lockheed Aircraft Corp., Sunnyvale, Calif.
ABSORPTION COEFFICIENTS OF AIR, by R. E. Meyerott, J. Sokoloff and R. A. Nicholls (U. of Western Ontario). Rept. on Contract AF 19(604)3893. Sep 59, 96p. 59 refs. LMSD-288052.
Order from LC mi$5.40, ph$15.30 PB 145 648

Tables of integrated absorption coefficients have been evaluated for high-temperature air by summation of the contributions from certain discrete and continuous transitions. The tables have been computed for dry air in the temperature range from 1,000°K to 12,000°K, at equal energy increments of 0.25 ev (2,016.5 cm^{-1}), in the wavelength range from 1,167 Å to 19,837 Å, and for density ratios relative to sea level, ρ/ρ_o, at each order of magnitude from 10 to 10^{-6}.

Lockheed Aircraft Corp., Sunnyvale, Calif.
ABSORPTION COEFFICIENTS OF AIR, by R. K. M. Landshoff and D. E. Buttrey. Final summary rept. on Contract AF 19(604)3893. Oct 59, 10p. 4 refs. LMSD-288070; AFCRC-TR-59-296; AD-231 436.
Order from LC mi$1.80, ph$1.80 PB 145 647

Tables of integrated absorption coefficients have been evaluated for high temperature air by studying various transitions involving a series of gaseous molecules and ions including the following: NO, O_2, N_2, N_2^+, N^-, N, and O. Temperature range studies covered 1,000°K to 12,000°K. A supplement continues a summation or research on the study of the absorption coefficients of hot gases for the analysis of nuclear fire balls and other high temperature sources.

Massachusetts U., Amherst.
THE POLARIZABILITY OF POLYPROPYLENE, by Daniel A. Keedy, Joseph Powers, and Richard S. Stein. Technical rept. no. 10 on Contract Nonr-2151(00). 28 May 59, 14p. 4 refs. AD-225 439.
Order from LC mi$2.40, ph$3.30 PB 145 747

Theoretical calculations are shown for the polarizability of a unit chain of isotactic polypropylene and for its refractive index and birefringence. The experimental evidence supports the use of Denbigh's bond polarizabilities (Trans. Faraday Soc. 36:936 1940) for the birefringence calculation of polypropylene. The measured birefringence of 40 to 70% crystalline polypropylene ranged from 20 to $30 \cdot 10^{-3}$ birefringence units.

Northwestern U. [Evanston, Ill.]
BRIDGED MECHANISM FOR THE PLATINUM(II) CATALYSIS OF CHLORIDE EXCHANGE IN CHLOROAMMINEPLATINUM(IV) COMPLEXES, by Melvin L. Morris, Fred Basolo, and Ralph G. Pearson. Rept. on Contract AF 49(638)315. 20 Nov 59, 30p. 23 refs. AFOSR-TN-59-1225.
Order from LC mi$2.70, ph$4.80 PB 145 844

A kinetic study was made of the platinum(II) catalyzed chloride ion exchange of various chloroammineplatinum(IV) complexes. The exchange was observed to follow the rate law $R = k[Pt(IV)][Pt(II)][Cl^-]$ and to be essentially the same as the rate of platinum exchange. The rate of chloride exchange with trans-$Pt(NH_3)_4Cl_2^{2+}$ is about 2,000 times faster than with the cis isomer and about 10,000 times faster than with $Pt(NH_3)_5Cl^{3+}$. There is no chloride exchange in the system trans-Pt(tetrameen)$_2Cl_2^{2+}$ - Pt(tetrameen)$_2^{2+}$ - $^*Cl^-$. All of these observations are explained on the basis of a two electron change redox reaction involving a bridged activated complex. (Author)

Rensselaer Polytechnic Inst., Troy, N. Y.
PHYSICAL PROPERTIES AND CONSTITUTION OF MOLTEN SALTS: ELECTRICAL CONDUCTANCE, TRANSPORT, AND CRYOSCOPY, by Cyril Solomons and George J. Janz. Technical note no. 6 on Contract AF 49(638)50. Dec 57, 94p. 278 refs. AFOSR-TN-58-17; AD-148 056.
Order from LC mi$5.40, ph$15.30 PB 146 521

A review is given of the literature on the theories and experimental techniques of electrical conductance, electrical transport, and cryoscopy of molten salt systems, with particular reference to problems of structure and constitution. (Author)

Rutgers State U., New Brunswick, N. J.
NUCLEAR MAGNETIC RESONANCE STUDY OF XENON, by R. L. Streever, Jr. and H. Y. Carr. Doctoral thesis. Rept. on Contract AF 18(603)6. 26 Jan 60, 29p. 13 refs. AFOSR-TN-60-106.
Order from LC mi$2.70, ph$4.80 PB 145 840

Thin spin lattice relaxation time T_1 of Xe^{129} has been measured as a function of temperature in the liquid and pressure in the gas.

Stanford Research Inst., Menlo Park, Calif.
THEORETICAL STUDY OF HIGH TEMPERATURE COMPOUNDS: BOND DISSOCIATION ENERGIES, by A. Paul Brady. Technical rept. no. 1 on Contract Nonr-2629(00). 1 June 59, 17p. 48 refs. SRI Project SU-2625.
Order from OTS $0.50 PB 161 546

A table of selected bond energies was constructed, using the latest kinetic and thermodynamic data and, in so far as possible, taking into account the influence of the atoms in the neighborhood of the breaking bond. It was found that the concept of a radical electronegativity is consistent and useful, providing the bond to hydrogen is considered a special case. Using the above concepts, it has been possible to estimate the strengths of a large number of bonds for which there are no experimental data. After a brief discussion of the concept of bond dissociation energies, a table of energies (confined, for the present, to the first two rows of the periodic table), together with an outline of its derivation is presented.

Ultrasonics Research Lab., Western Reserve U., Cleveland, Ohio.
ACOUSTO-ELECTROCHEMICAL EFFECTS IN ELECTRODE SYSTEMS, by Ernest Yeager. Technical rept. no. 22 on Contract Nonr-1439(04). 1 May 59, 3/p. 33 refs. AD-219 279.
Order from LC mi$3.00, ph$6.30 PB 145 899

The mechanisms by which sound waves produce dc and ac periodic and directional changes in the potentials of electrodes are considered. The importance of such phenomena in the study of electrode kinetics is also discussed. Schlieren techniques were used to examine the concentration gradients at both the cathode and the anode during the electrodeposition of Cu in order to obtain more specific information concerning the effects of sound waves on mass transport. Results indicated that the effective thickness of boundary layer was reduced to about 2μ with conventional forced convection and 1μ with ultrasonic waves. Estimates were made of the ratio of the surface concentration of $CuSO_4$ to that in the bulk of the solution (c_e/c_o) as a function of the acoustical intensity on the basis of quantitative interpretation of schlieren negatives. Two mechanisms proposed to explain the decreases in H overvoltage on Pt under conditions where concentration polarization involving the electrolyte should be

negligible were discussed. A kinetic treatment is given for the response of a reversible electrode to pressure and temperature variations. Electrode systems involving several consecutive reactions were considered.

EARTH SCIENCES

California U., Berkeley.
THE CAYS OF BRITISH HONDURAS, by Donald E. Vermeer. Rept. on Contract Nonr-222(11). 1959, 134p. 41 refs.
Order from LC mi$6.90, ph$21.30 PB 145 871

Willow Run Labs., U. of Michigan, Ann Arbor.
OBSERVATIONS OF HIGHER-MODE RAYLEIGH WAVES, by James T. Wilson, Walter Chapelle and John C. Johnson. Memo. on Proj. Michigan, Contract DA 36-039-sc-52654. Apr 59, 12p. 6 refs. Rept. no. 2144-409-R; AD-214 304.
Order from LC mi$2.40, ph$3.30 PB 145 973

Observations of Rayleigh waves were made using explosives and large falling weights as sources. Low-frequency vertical and horizontal geophones were used out to a range of 1900 ft. The velocities and frequencies of the various observed seismic waves are discussed, and surface-wave dispersion curves compiled. Weight drops were found to generate higher frequencies than explosive charges. Second-mode Rayleigh waves were observed. (Author)

Yale U., New Haven, Conn.
LATE PLEISTOCENE CHANGES OF SEALEVEL IN SOUTHWESTERN MAINE, by Arthur L. Bloom. Final rept. on Contract Nonr-609(25). 15 May 59, 180p. 76 refs.
Order from LC mi$8.10, ph$27.30 PB 146 175

At some time between 7,000-8,000 yr B.P. and 4,200 yr B.P. the coast of southwestern Maine was emerged at least 2 ft and perhaps 8-9 ft greater than present. Progressive submergence has continued from then to the present time.

Climatology and Meteorology

Air Weather Service, Scott AFB, Ill.
THE LOCAL-AREA SURFACE CHART, ITS PREPARATION AND USE. 29 Jan 60, 82p. 33 refs. Air Weather Service Manual 105-35.
Order from LC mi$4.80, ph$13.80 PB 146 483

This manual includes the suggested plotting procedures, the various techniques recommended to obtain the best analysis and prognosis of the weather in the local area, and the suggested methods for preparing a forecast from the analyzed Local-Area Surface Chart. Some modifications of the chart are presented for occasions where lack of time and personnel deny use of the complete analysis and prognostic procedure. The utilization of facsimile charts in conjunction with the Local-Area Surface Chart is also discussed.

Allied Research Associates, Inc., Boston, Mass.
RADAR PATTERNS AS A FORECAST AID; A CASE STUDY, by Raymond Wexler. Rept. on Contract AF 19(604)3492. 29 May 58, 23p. 6 refs. AFCRC-TN-58-262; AD-152 619.
Order from LC mi$2.70, ph$4.80 PB 146 201

On 2 December 1952, surface weather map indications and a lowering cloud deck threatened imminent snow to the Boston area. However, changing radar echo patterns aloft gave three important clues that precipitation would not be appreciable: (1) The transformation of the upper portion of the echo from a uniform pattern (type 3) to a cellular pattern (type 1) with top at a lower level, indicated advection of dry air aloft and a reduced precipitation rate, (2) A simultaneous cessation of the stalactites at the echo base also indicated a reduced precipitation rate, (3) A remarkably changing wind profile, as determined from the slopes of the trails, indicated advection of warm air tending to stabilize the precipitation forming region near the echo top. Indeed, it turned out that only a trace of snow fell during the succeeding 24-hour period.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
FACTORS INFLUENCING THE USE OF RAWIN SET AN/GMD-2 IN ARTILLERY METEOROLOGICAL SYSTEMS, by William Todd. 22 Aug 58, 20p. 8 refs. USASRDL Technical rept. 1978; AD-205 398.
Order from LC mi$2.40, ph$3.30 PB 139 075

A comparison is made of the operational characteristics of Rawin Sets AN/GMD-1( ) and AN/GMD-2 in determining the winds that exist aloft. The advantages of each system are discussed with respect to use of these sets for obtaining ballistic corrections for artillery. The performance of these systems is compared to a ballistic wind requirement of 1 mph and the inherent limitations of accuracy imposed by the variability of meteorological conditions with space and time as would be experienced in typical army operations. Conclusions indicate that the AN/GMD-1 system provides adequate performance except under conditions of extremely high wind. (Author)

Chicago U., Ill.
AXIAL VELOCITY STREAKS IN THE JET STREAM: AGEOSTROPHIC "INERTIAL" OSCILLATIONS, by Chester W. Newton. Technical rept. no. 2 on National Science Foundation Grant NSF-G6353 and Contract Nonr-2121(10). Apr 59, 28p. 13 refs.
Order from LC mi$2.70, ph$4.80 PB 145 795

An air particle alternately speeds up and slows down, as it passes through local isotach maxima. It is shown that on the average, the observed period of such speed variations in the core of the jet stream is about twice the period of an inertial oscillation. Periods are somewhat longer for mean anticyclonically-curved, and shorter for cyclonically-curved flow.

The length of a maximum velocity streak, measured between successive points of minimum speed, is greatest when the average wind speed in the jet axis is large, and is greater at low than at high latitudes, other things being equal. This behavior is consistent with the hypothesis that, for an air particle in the jet core, the geostrophic (or gradient) wind velocity varies at one-half the vector change in the actual wind velocity. Outside the jet core, where periods are longer due to smaller wind speeds, the geostrophic (or gradient) wind more nearly accommodates to changes in the actual wind velocity. (Author)

Coastal Studies Inst., Louisiana State U., Baton Rouge.
INFLUENCE OF HURRICANE AUDREY ON THE COASTAL MARSH OF SOUTHWESTERN LOUISIANA, by J. L. Chamberlain (Randolph-Macon Woman's Coll.). Technical rept. no. 10, Pt. B, on Contract N7onr-35608. 1 June 59, 44p. 14 refs. AD-218426.
Order from LC mi$3.30, ph$7.80 PB 146 482

Four distinct phases of the effects of Hurricane Audrey, which struck the coastal area of southwestern Louisiana on June 27, 1957, were studied: (1) general changes in the marsh environment; (2) soil salinity and marsh plant distribution; (3) distribution of beach vegetation; and (4) descriptions of the mud arcs. The three general changes outlined were climatic, gross physical, and vegetational. It was concluded that the variations in soil salinity may have reflected normal seasonal fluctuations rather than storm-induced changes, since post-hurricane sampling was one month after the storm. Horizontal distributions of the plants on the beach were altered by changes in the beach profile, but are evolving toward a stable zonation which will be accomplished when the beach is in balance with the physical forces. The force of the hurricane carried 2 large masses of clay over the beach and deposited them as units (mud arcs) to eventually become permanent features of the shoreline stratigraphy. They were studied in the light of their physical features and vegetation.

Daniel Guggenheim Airship Inst., Akron, Ohio.
RELATION BETWEEN GUSTS AND AVERAGE WINDS FOR HOUSING LOAD DETERMINATION, by P. O. Huss. Rept. on Contract Cwb-6103. June 46, 117p. 3 refs. DGAI rept. no. 140; AD-118 626.
Order from LC mi$6.00, ph$18.30 PB 146 484

Major interest in this study lay in the ratio (f_w) between the peak velocities (V_i) and the "fastest single mile" velocity (V_w) and, also, in the variation with height of the velocities and the above ratio. The ratio appears to vary statistically at a given height and the variation with height follows an inverse exponential relation, $f_w = kh^{-1/n}$. The variation of the velocity with height is, as has been noted by other investigators, a rather erratic factor, but the usual form $V/V_o = (h/h_o)^{1/n}$ is fairly accurate above the 40 foot level. It appears, however, that this exponent varies also with the probability relationship, the average value being in order of 6.5 for the average velocities and 11 for the peaks.

Johannes Gutenberg-Universität, Mainz (West Germany).
INVESTIGATIONS ON THE HEAT BALANCE OF THE TROPOSPHERE, by Günther Korb, Johannes Michalowsky and Fritz Möller. Technical rept. no. 2 on Contract AF 61(514)1005. Nov 57, 87p. 4 refs. AFCRC-TN-58-238; AD-152 471.
Order from LC mi$4.80, ph$13.80 PB 146 228

The investigation on the tropospheric radiation balance, was centered on giving an easy applicability to the methods developed. A method is proposed for simple determination of tropospheric water vapor content from dew point measurements of the usual radiosonde ascents. A clear representation of short-wave absorption with clouded and cloudless skies is described. It appears that the absorption can be represented in dependence on geographic latitude and total water vapor content for any cloud given. This simple method for determination of short-wave absorption together with the method for determination of long-wave emission, given previously, is used for calculation of the tropospheric radiation balance during July and November 1955. The maps of absorption, emission, and tropospheric radiation balance make it evident that regions of high and of low values can be defined. It can be concluded that regions of high and low values of the tropospheric radiation balance are not formed based on simple relations but result from the complicated coherence of many independent factors.

MacDonald Physics Lab., McGill U. (Canada).
ALBERTA HAIL, 1958 AND RELATED STUDIES, PARTS I-III, by R. H. Douglas, R. H. D. Barklie and N. R. Gokhale. Rept. on Contract AF 19(604)2065. July 59, 69p. 9 refs. Stormy Weather Research Group Scientific rept. MW-30; AFCRC-TN-59-448; AD-225 399.
Order from LC mi$3.90, ph$10.80 PB 146 512

Contents:
Alberta field studies
  Hail reports, 1957 and 1958
  Echo top heights and temperatures
  Hail areas and shafts
  Measurements of hail
Growth by accretion
  Growth rates
  Density of particle and of accreted material
  Growth calculations
The freezing of supercooled water drops
  The effect of time on the freezing process
Constant temperature method
Illustration of the random nature of the freezing process
Constant rate of cooling method
Comparison of results obtained by 3 methods
Effect of increasing purity on the values of A and B
The effect of sudden chilling

Massachusetts Inst. of Tech., Cambridge, Mass.
NUMERICAL INTEGRATION OF THE PRIMITIVE EQUATIONS ON THE HEMISPHERE, by Norman A. Phillips. Technical rept. on Numerical Weather Prediction Project, Contract Nonr-1841(18). June 59,

43p. 17 refs. AD-218 148.
Order from LC mi$3.30, ph$7.80 PB 146 475

A 48-hr forecast for the entire Northern Hemisphere of a barotropic hydrostatic atmosphere is made with the primitive equations. Overlapping Mercator and stereographic grids are used together with the finite-difference scheme. Initial data corresponded to a Haurwitz-type pattern of wave number 4, the initial wind field was non-divergent, and the initial geopotential field satisfied the balance equation. The computations seem to be stable and well-behaved, except for 2 small temporary irregularities. The amplitude of the gravity-inertia waves present in the forecast geopotential field is about 1/30 that of the large-scale field. This is shown to be due to the neglect, in the initial data, of the quasi-geostrophically conditioned divergence field. The computational technique does not give any unreal prominence to the meteorological noise. The computational characteristics and stability criterion of the Eliassen-type finite-difference system are investigated for a linearized version of the equations. This finite-difference system possesses 6 computational frequencies. The extra frequencies arise from the advective terms in the equations of motion. (Author)

Michigan U. [Research Inst.] Ann Arbor.
PRESSURE AND DENSITY MEASUREMENTS THROUGH PARTIAL PRESSURES OF ATMOSPHERIC COMPONENTS AT MINIMUM SATELLITE ALTITUDES, by H. S. Sicinski, N. W. Spencer, and R. L. Boggess. Rept. on Contract AF 19(604)545. Mar 56, 13p. 13 refs. Rept. CS-5; 2096-14-S.
Order from LC mi$2.40, ph$3.30 PB 137 511

[Quartermaster Research and Engineering Center, Natick, Mass.]
HANDBOOK OF YUMA ENVIRONMENT, by Albert H. Jackman. Feb 53, 60p. 11 refs. Environmental Protection Branch rept. no. 200.
Order from LC mi$3.60, ph$9.30 PB 146 815

Heat and drought are the major climatic controls over desert testing in the Yuma Test Area. About one-half the days of the year have maximum temperatures of 90°F. or above, and nearly one-third the days have maximum temperature of 100°F. or over. High temperatures and heat stress problems are most frequent from May through September. Winters (December through February) are cool. The low rainfall of the Yuma region is indicated by its mean annual precipitation of 3.38 inches. Moist air, however, sometimes moves over the region from the Gulf of California bringing fairly high humidities which are particularly noticeable during July and August. Other meteorological factors considered in this report include dew points, wind speeds, and cloud cover. The topographic arrangement or form ranges from low, flat bottomlands with practically no slope gradient to rugged mountain terrain with characteristic gradients of 20 to 45 degrees. Most of the area has a sparse vegetation cover of low shrubs, with growths of small thorny trees in the washes and other drainage channels. The smaller shrubs are generally stiff and woody; certain species of cactus present a special protection problem due to their spines. Only in bottomlands where the water table is near the surface is there a dense shrub or tree growth consisting of mesquite, tamarisk (salt cedar), arrowweed, willows, or cottonwoods. Where there is surface water standing most of the year, as in the river overflow areas, there are dense growths of cattails and other semi-aquatic plants.

Washington U., Seattle.
ON VALLEY AND MOUNTAIN WINDS, by Konrad J. K. Buettner and Norman Thyer. Final rept. on Contract AF 19(604)2289. Sep 59, 30p. 15 refs. AFCRC-TR-59-283; AD-231 495.
Order from LC mi$2.70, ph$4.80 PB 146 193

Air currents were investigated in and above the Carbon River Valley in the northwest corner of Mt. Rainier National Park. Observations were made mostly with pibals; wiresonde, tethered balloons, and airplanes. Preference for investigation was given to clear days, and nights with low geostrophic winds. A permanent wind and radiation station was installed in the more distal part of the valley. A daytime valley wind and a nighttime mountain wind flow quite regularly. These winds fill the valley to nearly ridge level. About 300 m above the ridge level compensation currents or anti-valley and anti-mountain winds begin. All four currents are stronger in the more distal valley. Currents in the valley and their respective anti-winds are separated by a highly irregular mixing layer 200-300 m in thickness. Nighttime winds are quite erratic.

Frost Science

ARDE Associates, Newark, N. J.
ANTENNA FOUNDATION DESIGN STUDY, by M. Scheinberg, B. J. Aleck and others. Rept. on Contract AF 30(602)1872. 30 Sep 59, 513p. 45 refs. ARDE rept. no. 3584-1; RADC-TR-59-251.
Order from LC mi$11.10, ph$78.90 PB 146 493

This report contains the results of a study to devise new types of foundations and to evaluate these as well as existing foundations for extremely large, permanent antennas located in Arctic areas. Novel types of foundations, specifically designed for stability in permafrost soils, are presented. Optimum foundation types for several different antennas and for a number of typical Arctic soil conditions are given. Methods for design of these foundations are presented which provide for long time stability under extreme conditions. (Author)

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
THE NARROW INFINITE WEDGE ON AN ELASTIC FOUNDATION, by D. E. Nevel. Rept. on Bearing Capacity of Floating Ice Sheet. July 58, 22p. 4 refs. Technical rept. 56; AD-208 019.
Order from LC mi$2.70, ph$4.80 PB 146 499

A solution to the problem is presented to serve as a basis for predicting where and under what conditions a circumferential crack will develop in a floating ice sheet. The solution assumes a wedge angle small

enough that tangential bending can be neglected as well as the absence of lateral forces exerted on the wedge by adjacent wedges. The differential equation describing the problem is:

$$\frac{d^4y}{d\chi^4} + \left(\frac{2}{\chi}\right)\left(\frac{d^3y}{d\chi^3}\right) + y = 0$$

and its solution reads: $y = A\,nev_0(\chi) + B\,nev_1(\chi) + C\,nev_2(\chi) + D\,nel_1(\chi)$, where A, B, C, and D are constants of integration and nev_0, nev_1, nev_2, and nel_1 are functions defined by an infinite series. (Author)

Dartmouth Coll., Hanover, N. H.
CRYSTALLOGRAPHIC ORIENTATION IN LAKE AND ARTIFICIAL ICE, by J. B. Lyons and R. E. Stoiber. Scientific rept. no. 2 on Contract AF 19(604)2159. 31 Oct 59, 20p. 9 refs. AFCRC-TN-59-655.
Order from LC mi$2.40, ph$3.30 PB 146 200

Observations on lake ice and ice frozen experimentally at -10°C under varying conditions of thermal flux and in some cases with a stream of air directed toward the surface lead to the conclusions that ice orientation may best be explained in terms of (1) thermal gradients in the growth medium (water), (2) thickness of the supercooled water layer, (3) mechanical effects such as fragmentation of the earliest-formed ice skim, and (4) more rapid crystallization velocity in the basal plane of ice. The crystallographic fabric of the ice formed under several different experimental conditions is presented in a series of illustrations. (Author)

Engineer Corps [Washington, D. C.]
GREENLAND ICE CAP RESEARCH PROGRAM: STUDIES COMPLETED IN 1954. VOL. 2. Feb 57, 245p.
Order from LC mi$11.10, ph$37.80 PB 146 024

Contents:
Glaciological investigations in the Thule Ramp area. SIPRE rept. 28
Approach roads, Greenland 1954 program. ACFEL Technical rept. no. 64
Pipeline study, Greenland, by Army Engineer Research and Development Labs.
Excavations and installations at SIPRE Test Site, Site 2, Greenland. SIPRE rept. 20
Instrumentation of Ice Cap stations. Preliminary rept. SIPRE rept. 23
Structures for snow investigations on the Greenland Ice Cap. SIPRE rept. 27
Sewage disposal at Ice-Cap installations. SIPRE rept. 21 (PB 128 111)
(See also PB 146 022)

Engineer Corps [Washington, D. C.]
GREENLAND ICE CAP RESEARCH PROGRAM. STUDIES CONDUCTED IN 1955-56. VOL. 1. May 58, 182p.
Order from LC mi$8.40, ph$28.80 PB 146 023

Contents:
Report on Greenland operation, 1955-1956, by Army Engineer Research and Development Labs.
Strength studies of high-density snows, SIPRE research rept. 18 (PB 132 802)
Preliminary study of crevasse formation. SIPRE rept. 38
The effect of snow properties on vehicle trafficability in the Arctic. SIPRE special rept. 22
Radiation measurements on the Greenland Ice Cap. SIPRE research rept. 19
Measurements by SIPRE in 1955 on the accumulation markers of Expeditions Polaires Françaises in Central Greenland. SIPRE special rept. 19
Resupply of Ice-Cap expeditions by air drop, SIPRE special rept. 17 (See also PB 146 024)

Engineer Corps [Washington, D. C.]
GREENLAND ICE CAP RESEARCH PROGRAM. STUDIES CONDUCTED IN 1955 - 56, VOL. 2. Oct 58, 178p. 57 refs.
Order from LC mi$8.10, ph$27.30 PB 146 025

Contents:
On the deformation of excavations in the Greenland neve. Apr 57, SIPRE Research rept. 30
Some preliminary observations on the plasticity of Greenland glaciers. July 57, SIPRE Research rept. 33
Shear moraines in the Thule area, Northwest Greenland. Jan 57, SIPRE Research rept. 17
Movement observations on the Greenland Ice Cap. Aug 57, SIPRE Special rept. 24
Ice tunnel, Tuto area, Greenland. Feb 58, SIPRE Technical rept. 44
Precipitation trends in Greenland during the past 30 years. Dec 56, SIPRE Research rept. 22
Occurrence of blowing snow on the Greenland Ice Cap. Apr 57, SIPRE Research rept. 25 (PB 143 317)
White-out in Greenland. Dec 56, SIPRE Research rept. 21 (PB 128 113)
A reconnaissance for a southern Greenland ice-cap access for military purposes. Apr 57, SIPRE Technical rept. 46.
(See also PB 146 023)

Engineer Corps [Washington, D. C.]
GREENLAND ICE CAP RESEARCH PROGRAM. STUDIES CONDUCTED IN 1955-56. VOL. 3. June 59, 193p.
Order from LC mi$8.70, ph$30.30 PB 146 026

Contents:
Approach roads, Greenland 1955 program. ACFEL technical rept. 60; AEWES technical rept. 3-505
Design and construction of an undersnow camp on the Greenland Ice Cap. USA Polar R&D Center rept. 1
Proposed relocation of Camp Tuto and access road. SIPRE technical rept. 52 (PB 138 228)
The cryoconite of the Thule area. SIPRE research rept. 50
Polar glaciology study course. SIPRE special rept. 26
(See also PB 146 025)

Engineer Corps [Washington, D. C.]
GREENLAND ICE CAP RESEARCH PROGRAM. STUDIES COMPLETED IN 1954, VOL. 1 Feb 57, 244p. 5 refs.
Order from LC mi$11.10, ph$37.80 PB 146 022

Contents:
Report on Greenland Operation, 1954, by Army Engineer Research and Development Labs.
Scientific work of Party Crystal, 1954. Preliminary rept. SIPRE rept. 24
Operations and logistics of Ice-Cap Party Crystal, 1954. SIPRE rept. 25

Study of ice fabrics, Thule area, Greenland. SIPRE rept. 26
Trafficability of snow, Greenland Studies, 1954, AEWES TM-3-414, rept. no. 2

Geodesy

[Arctic Inst.], Catholic U. of America, Washington, D. C.
A SYSTEM OF KEYS FOR THE INTERPRETATION OF VEGETATION FROM AERIAL PHOTOGRAPHY OF THE CHESAPEAKE BAY AREA, by Hugh O'Neill, Oswald Schulte, and others. Technical rept. no. 1 on Interpretation of Vegetation on Aerial Photography, Contract N6onr-25504. Aug 50, 256p. 47 refs.
Order from LC mi$11.10, ph$39.60 PB 146 352

Contents:
A system of keys for the identification of vegetation from aerial photography of the Chesapeake Bay area
Characteristics of vegetation of use in interpreting vegetation from aerial photography of
(a) Chesapeake Bay area
(b) Any area. generalizations
Monographic descriptions of the photographic characteristics of some important species of trees and other plants of the Chesapeake Bay area especially prepared for photographic interpreters
List of important Chesapeake indicator plants and what they indicate
Geology and soils of the Chesapeake Bay area
An important assistance in interpreting vegetation from aerial photography

Geographisches Institut der Universität Zürich (Switzerland).
INTERPRETATION OF LAND UTILIZATION FROM AERIAL PHOTOGRAPHS, by Hans Boesch and Dieter Steiner. Final technical rept. for 1 Nov 58-31 Oct 59 on Contract DA 91-591-EUC-975. 1959, 73p. 70 refs. AD-232 725.
Order from LC mi$4.50, ph$12.30 PB 145 950

Systematic study was made of gray tone, texture, and stereoscopic appearance on panchromatic air photographs, taken at different seasons over different regions of Switzerland. The base material consisted of air photographs taken at different seasons, partly at different day-times. Land-use mapping in the field was carried out shortly after the photographs were taken. The usefulness of gray tone, texture, and stereo-effect for the interpretation and the possibilities of distinguishing different types of land-use were evaluated by means of statistical methods. (Author)

Geography

Coastal Studies Inst., Louisiana State U., Baton Rouge.
COASTAL GEOGRAPHY CONFERENCE [NO. 2] HELD APRIL 6-9, 1959, AT THE COASTAL STUDIES INSTITUTE, LOUISIANA STATE UNIVERSITY, by Richard J. Russell. Rept. on Contract Nonr-2300(07). 1959, 457p. 381 refs. AD-218 547.
Order from LC mi$11.10, ph$68.10 PB 146 524

Contents:
Coastal classification maps
An analysis of coastal climates, with particular reference to humid midlatitudes
Origin and development of the Texas shoreline
Padre Island and the Laguna Madre Flats, coastal South Texas
The geomorphology of the Guiana coast
Coastal sand ridges and marshes and their environment near Grand Polo and Ouidah, Dahomey
Geomorphological reconnaissance of the northwest coast of Cape York Peninsula (Northern Australia)
Littoral and submarine morphology of the Rhone Delta
The development of the coastline of the Wash, England
Dutch post-war coastal studies
The Danish moraine archipelago as a research field for coastal morphology and dynamics
Archaeology and physiography in coastal studies
Methods of correlating cultural remains with stages of coastal development
Mississippi deltaic plain flight
Alluvial morphology field trip
Coastal marsh and chenier field trip
Southwestern Louisiana field trip - Land and man in the chenier, Louisiana

Louisiana State U. [Baton Rouge.]
THE PHYSICAL GEOGRAPHY OF THE LOWER COASTAL PLAIN OF THE GUIANA COAST, by John H. Vann. Technical rept. no. 1 on Contract Nonr-1575(02). 14 Apr 59, 103p. 56 refs.
Order from LC mi$5.70, ph$16.80 PB 146 168

The purpose of this study is the investigation of the lower coastal plain landforms and the processes that have fashioned these forms. Furthermore, it is hoped that the description of the landforms may aid in the terrain analysis of tropical coastal lowlands.

Oceanography

Air Force Cambridge Research Center, Bedford, Mass.
SCIENTIFIC STUDIES AT FLETCHER'S ICE ISLAND, T-3, 1952-1955. VOLUME II, by Vivian Bushnell. Dec 59, 126p. 38 refs. Geophysical Research Papers no. 63, AFCRC-TR-59-232(2); AD-216 814.
Order from OTS $2.75 PB 161 691

Results of field investigations are presented and include a summary of surface meteorological observations, a study of upper air temperatures, and an analysis of solar radiation data. Appendixes include tables of surface meteorological observations, mean monthly upper-air temperatures at selected levels, solar radiation data, and plots of position lines with resulting geographical locations. (Author) (See also PB 161 289)

Scripps Institution of Oceanography, U. of California, San Diego.
FINAL REPORT. Rept. for 1 Apr 56-16 Sep 58 on Contract Nonr-233(42). 6 Apr 59, 14p. 4 refs. SIO Ref. 58-77; AD-225 715.
Order from LC mi$2.40, ph$3.30 PB 145 706

Outlines work done on buoys and batteries, sensing systems and moorings.

Weather Forecasting Research Center, U. of Chicago, Ill.
EVAPORATION FROM THE OCEANS, by W. C. Swinbank. Scientific rept. no. 12 on Contract AF 19(604)2179 and National Science Foundation Grant NSF-G6385. Dec 59, 18p. 10 refs. AFCRC-TN-60-211.
Order from LC mi$2.40, ph$3.30 PB 146 194

The present report by Dr. W. C. Swinbank was prepared to provide an up-to-date formula for computations of the exchange of latent heat between the oceans and the atmosphere. The results of these computations, with special reference to the energy supply of mobile motion systems on the North Atlantic, will be described in separate reports.

Woods Hole Oceanographic Institution, Mass.
OCEANOGRAPHIC DATA FROM THE CARIBBEAN SEA "CRAWFORD" CRUISE 17, FEBRUARY-MARCH 1958 FOR THE INTERNATIONAL GEOPHYSICAL YEAR OF 1957-58, by W. G. Metcalf. Rept. on Contract Nonr-2196(00). Apr 59, 89p. 6 refs. Reference no. 59-9.
Order from LC mi$4.80, ph$13.80 PB 146 245

In the present report, the oceanographic data are presented in a form similar to that used earlier. Four north-south cross sections of the Caribbean Sea were made. Station positions from CRAWFORD Cruise 17 are shown in Figure 1. Also included are the Caribbean stations from the 1954 ATLANTIS cruise. Temperature, salinity and oxygen profiles for each section are presented on a base showing the observation points and the bottom contours in Figures 2 through 19 The tabular data are presented in the same form as those from earlier cruises. The position given is the mean for each station. The GMT is the time at which the messenger was sent for the first (shallow) cast. The Depth is the sonic depth corrected for the speed of sound in sea water according to Matthews' (1939) tables and is rounded off to the nearest five meters. In some instances the bottom bottle tripped on the ocean floor, and the depth has been calculated from paired protected and unprotected reversing thermometers. The BT# is the slide number of the bathythermogram obtained for the station. In most cases, the bathythermograph lowering was made shortly before the ship stopped or shortly after getting underway in connection with each station. Salinities were determined on the Woods Hole Mark II salinometer. Dissolved oxygen determinations were carried out by the Winkler method. Hourly bathythermograph lowerings were made while underway, sea conditions permitting. The tracings of the bathythermographs presented were prepared in the manner described by Fuglister. Below each tracing is given the following information: First line: Slide number G.C.T., Day, Month, Year, Wind Direction (in tens of degrees, True) and Wind Force (Beaufort Scale). Second line: Latitude and Longitude. Third line: Surface (bucket) temperature.

Physics of the Atmosphere

Brown U. Div. of Applied Mathematics, Providence, R. I.
THE DYNAMICS OF ISOTROPIC TURBULENCE IN TWO DIMENSIONS, by W. H. Reid. Technical rept. no. 23 on Contract Nonr-562(07). Apr 59, 25p. 11 refs. 562(07)/23.
Order from LC mi$2.70, ph$4.80 PB 145 796

The dynamical equations which describe the behavior of isotropic turbulence in two dimensions are derived under the assumption that all fourth-order cumulants of the velocity field vanish. Due to the absence of vortex line stretching, the transfer mechanism which developes in this case differs markedly from the usual three-dimensional one. For example, an initial energy distribution in the form of a single line spectrum is found to remain unchanged. More generally, however, there is found to be an almost equal transfer of energy from the medium sized eddies to both smaller and larger eddy sizes. The large magnitude of this 'back-transfer' suggests the need for caution when applying the usual cascade arguments to turbulence in two dimensions. These results would seem to be relevant to the problem of the large-scale motions in atmospheric turbulence which are known to exhibit certain two-dimensional characteristics. (Author) (See also PB 145 799)

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
CONCERNING THE PHENOMENON OF SPREAD F IN THE IONOSPHERE, by J. Renau. Technical rept. no. 51 on Studies on Propagation in the Ionosphere, Contract DA 36-039-sc-74903. 30 Oct 58, 19p. 11 refs. Research rept. EE-393.
Order from LC mi$2.40, ph$3.30 PB 146 166

To shed some light on the phenomenon of Spread-F, a thin scattering screen is postulated above the E region. Experimental ionograms are presented that substantiate the theory, although there are a large number of occurrences of spread-F whose characteristics apparently cannot be explained by the mechanism suggested.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
STUDIES ON PROPAGATION IN THE IONOSPHERE, by H. G. Booker, D. Farley and others. Quarterly progress rept. no. 1 on Contract DA 36-039-sc-78258. 15 Feb 59, 20p. 4 refs. Research rept. EE-416.
Order from LC mi$2.40, ph$3.30 PB 146 157

Work is continuing on the possibility of transfer of irregularities of electric field from lower heights up to the F region. Equations have been derived for the radar echo strength backscattered from nonisotropic irregularities of ionization.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
STUDIES ON PROPAGATION IN THE IONOSPHERE, by D. Farley and J. Renau. Quarterly progress rept. no. 2 on Contract DA 36-039-sc-78258. 15 May 59, 52p. 10 refs. Research rept. EE 425.
Order from LC mi$3.60, ph$9.30 PB 146 065

The theoretical examination of the possibility of transferring irregularities of electric field from lower heights up to the F-region of the ionosphere has been continued. (See also PB 146 157)

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
STUDIES ON PROPAGATION IN THE IONOSPHERE, by H. G. Booker, B. Nichols and others. Progress rept. no. 3 on Contract DA 36-039-sc-74903. 30 June 58, 33p. 3 refs. Research rept. EE 379; AD-204 119.
Order from LC mi$3.00, ph$6.30 PB 138 117

A critical review has been begun of the various unsolved questions connected with ionospheric turbulence. Equipment that had been prepared for measuring the height of phase scintillations using Sputnik III was put into operation. The results were disapointing, apparently due to low radiated power from Sputnik III. An investigation has been begun of the idea due to Dagg that phase scintillation spread-F could be due to ionospheric turbulence below the F-region. The idea is that turbulence in the E-region might cause irregularities of space charge and hence irregularities of electric field. The IGY auroral radar, operating continuously at 41.0 Mc/s, has been used for a series of new measurements of the decay of long-duration meteor echoes. Figures and tables showing some of the results are presented herewith. (See also PB 135 964)

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
A THEORY OF ELECTROSTATIC FIELDS IN A HORIZONTALLY STRATIFIED IONOSPHERE SUBJECT TO A CONSTANT, VERTICAL MAGNETIC FIELD, by D. T. Farley. Technical rept. no. 52 on Studies on Propagation in the Ionosphere, Contract DA 36-039-sc-74903. 31 Dec 58, 33p. 9 refs. Research rept. EE-397.
Order from LC mi$3.00, ph$6.30 PB 146 165

A theory is developed to describe quantitatively the idea that, in an ionized gas subject to an imposed magnetic field, such as the ionosphere, the lines of magnetic flux are approximately equipotential lines. The analysis indicates that in the ionosphere the results are strongly affected by the variation of conductivity with height, as well as the anisotropy.

Deutscher Wetterdienst, Offenbach (West Germany).
CELL STRUCTURE OF THE ATMOSPHERE: FIGURES, by Heinrich Faust and Walter Attmannspacher. Final rept., Part 2 on Contract DA 91-508-EUC-387. Oct 59, 161p. AD-231 503.
Order from LC mi$7.80, ph$25.80 PB 146 220

See also PB 146 219

Deutscher Wetterdienst, Offenbach (West Germany).
CELL STRUCTURE OF THE ATMOSPHERE: TEXT, by Heinrich Faust and Walter Attmannspacher. Final rept., Part 1 on Contract DA 91-508-EUC-387. Oct 59, 102p. 17 refs. AD-231 502.
Order from LC mi$5.70, ph$16.80 PB 146 219

Contents:
The null layer of the upper troposphere
Extremes of the horizontal wind and the vertical velocity
Null layer analysis
The layer of scalar wind minimum
The correlation between the wind profiles and the weather situations
Investigations on dissolving pressure systems
Mean temperature distribution over the northern hemisphere
On the existence of an upperstratospheric layer of maximum wind
On the general circulation of the extratropical latitudes
Investigations on air density
Meteorological terminology

New York U. Coll. of Engineering, N. Y.
DYNAMICS OF THE MESOSPHERE, by Julius London, Bernhard Haurwitz, and Katsuyuki Ooyama. Final rept. on Contract AF 19(604)1738. Dec 59 [44]p. 18 refs. AFCRC-TR-60-206.
Order from LC mi$3.30, ph$7.80 PB 146 192

The final report is divided into five sections covering the main phases of the project research. These deal with: 1. The radiation budget of the upper atmosphere 2. The distribution of atmospheric ozone. 3. Motions in the upper atmosphere. 4. Studies of atmospheric tides. 5. Solar-weather relationships.

Vienna U. (Austria).
EXPERIMENTAL INVESTIGATION OF THE CARBONDIOXIDE CONTENT OF THE AIR AND AN ANALYSIS OF ITS GASEOUS AND COLLOIDAL PHASES, by Georg Stetter. Final technical rept. for 1 Jan-31 Dec 59 on Contract DA 91-591-EUC-1012. Dec 59, 76p. 13 refs.
Order from LC mi$4.50, ph$12.30 PB 145 947

Contents:
Chemical methods
High frequency titration of CO_2
The determination of CO_2 by URAS
Measurement of humidity based on the scattering of high energy neutrons
Determination of CO_2 by an optical method

ENGINEERING

Army Chemical Warfare Labs., Army Chemical Center, Md.
VALVE, ANTIBACKDRAFT, E2R2 (FINAL ENGINEERING TEST NO. 117) by Donald F. McFarland, Jr. Oct 59, 46p. CWLR-2314; AD-229 340.
Order from LC mi$3.30, ph$7.80 PB 145 755

This report covers in detail the final engineering test of an antibackdraft valve developed to maintain a constant static pressure in small portable shelters under collective protection. Results of the test program indicated that the valve was essentially satisfactory in filling the design characteristics. (Author)

Northwestern Technological Inst., Evanston, Ill.
A NEW METHOD OF WASTE DISPOSAL FOR ISOLATED SITES IN THE ARCTIC. I. CHEMICAL ADDITIVES AND MECHANICAL HOMOGENIZERS, by John A. Logan. Rept. for 30 Sep-31 Dec 58 on Contract AF 41(657)207. [1958] 19p. Technical note AAL-TN-59-5; AD-230 843.
Order from OTS $0.50 PB 161 540

Chemical additives, homogenizers, oil burners, toilets, oil burners and garbage disposal units are discussed. A preliminary layout for a camp of 50-100 men is attached to the report.

Aeronautical Engineering

[Aero Space] Medical Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
MAN'S ABILITY TO APPLY CERTAIN TORQUES WHILE WEIGHTLESS, by Ernst Dzendolet and John F. Rievley. Apr 59, 33p. 8 refs. WADC Technical rept. 59-94; AD-220 363.
Order from LC mi$3.00, ph$6.30 PB 146 575

The torque that a maintenance man can exert within a space vehicle while weightless, and hence tractionless, is analyzed. Anthropological literature was reviewed to determined the torques a man can apply under normal conditions. Using elementary physical principles the consequences of applying these torques while tractionless were calculated. Certain of the predictions were verified experimentally. It is tentatively concluded that standard anthropometric data can legitimately be extrapolated to the weightless conditions. Suggestions are advanced regarding (a) the optimum body position for a simple tightening task without using a handhold, (b) the use and location of handholds, (c) maximum torque limitations, (d) the use of impulses, and (e) the design of hand tools. (Author)

Armour Research Foundation, Chicago, Ill.
MEASUREMENT OF AIR NAVIGATION ACCURACY ALONG CERTAIN VOR AIRWAYS, by G. W. Bond. Final rept. on Contract FAA/BRD-28. June 59, 131p.
Order from OTS $2.75 PB 161 652

During the winter of 1958-59 a large number of measurements were made, by means of a long-range radar, of the accuracy of air navigation along certain VOR airways within 130 miles of Kansas City. The measurements encompassed a variety of aircraft types and flight conditions, and were made generally without the pilots knowledge. The type, identity, assigned altitude, origin, destination, and reported times over certain VOR station were obtained for each aircraft from air traffic control records. Related weather and winds aloft data were obtained from the weather teletype. The positions of the VOR radials defining the airways in the area were also measured, by means of a specially instrumented aircraft.

Arnold Engineering Development Center [Tullahoma, Tenn.]
AERODYNAMIC LOADS ACTING ON THE CANTILEVERED NOSE SECTION OF THE COLEMAN AJ 10-33 ROCKET SLED AT TRANSONIC AND SUPERSONIC SPEEDS AS DETERMINED BY WIND TUNNEL TESTS, by Benford H. Johnson. Rept. on ARO, Inc. Contract AF 40(600)800. Jan 60, 32p. 2 refs. AEDC-TN-59-167. AD-231 447.
Order from LC mi$3.00, ph$6.30 PB 145 749

Wind tunnel tests were conducted on a 0.0298-scale model of the Coleman AJ 10-33 rocket sled to determine the aerodynamic loads acting on the cantilevered nose section of the model and to determine the rates of change of these loads with deflection of the nose section in pitch and yaw. The tests were performed with the model in the presence of a ground plane at Mach numbers from 0.6 through 2.5. Longitudinal and lateral loads were obtained in the deflection ranges of $\pm$3.0-deg angle of attack and $\pm$1.5-deg angle of yaw. Axial-force data were obtained from pressure distribution measurements on the nose section.

Bell Aircraft Corp. [Buffalo, N. Y.]
A STUDY OF VELOCITY-FREQUENCY-DAMPING RELATIONSHIPS FOR WING AND PANEL BINARY SYSTEMS IN HIGH SUPERSONIC FLOW, by Melvin B. Zisfein and Frank J. Frueh. Rept. on Contract AF 49(638)365. Oct 59, 64p. 11 refs. Rept. no. 9015-19-001; AFOSR-TN-59-969; AD-228 774.
Order from LC mi$3.90, ph$10.80 PB 145 978

Initial results are presented of a program to obtain and study analytical relations between flutter and dynamic response. Piston theory aerodynamics was used to study two kinds of binary systems, pitch-plunge wings and 2-degree-of-freedom simply supported panels. A major portion of the effort was focused on the effects of viscous and structural damping on the flutter and dynamic response characteristics and the relations between them.

deFlorez Co., Inc., Englewood Cliffs, N. J.
METHODS OF PRESENTING MOVING OBJECTS IN POINT LIGHT SOURCE VISUAL DISPLAYS. Rept. on Contract Nonr-1628(00). June 59, 68p. 2 refs. Technical rept. NAVTRADEVCEN 1628-5.
Order from LC mi$3.90, ph$10.80 PB 145 932

This report describes the results of an investigation to discover and analyze methods and systems whereby moving objects may be presented in point source projected visual displays. It includes an analysis of the nature of movement in the real world as a frame of reference for movement to be produced in the world of visual displays. A number of methods and systems have been devised which will project moving objects in point source visual displays. However, each system is quite limited in capability and can meet only

a particular and rather narrow range of requirements. None of these systems will produce a completely non-programmed moving object which will be completely realistic as well. In general, it is practicable to provide only one moving object.

Directorate of Flight and All-Weather Testing, Wright-Patterson AFB, Ohio.
OPERATION ANALYSIS TECHNIQUES FOR ESTIMATING THE EFFECT OF DELETING AIRCRAFT ICE PROTECTION SYSTEMS, by James K. Thompson. Sep 59, 14p. 15 refs. WADC Technical note 59-163; AD-216 082.
Order from LC mi$2.40, ph$3.30 PB 146 914

A method is defined for estimating the significance and frequency of encountering various total accumulations of ice on unprotected components during proposed operations. The technique has been evolved over a period of years and reduces available statistics and pertinent theory to practical graphs for use by personnel without previous experience in icing theory. Examples of application to three types of aircraft operations are provided to illustrate use of the technique and the effects of varying aircraft speeds and operational altitudes. (Author)

Goodyear Aircraft Corp., Akron, Ohio.
ROUGH TERRAIN LANDING GEAR EVALUATION PROGRAM, by George Schuck. Rept. on Contract DA 44-177-TC-436. 15 Mar 59, 275p. 10 refs. GER 9244; AD-206 902.
Order from LC mi$11.10, ph$42.60 PB 145 804

This report covers the testing of an L-19A "Bird dog" liaison airplane equipped with Goodyear Terra tires, air wheels and the Standard 700 x 5 tire. The tests were conducted over sand, mud, and simulated rough terrain. The results indicate that the use of large size low pressure tires improves performance over both the sand and mud. The large low pressure tires show indication of greater energy absorption than the standard tires; however, the area of optimum pressure for the large tires appeared to be below the inflation pressure range tested. (Author)

Hiller Aircraft Corp., Palo Alto, Calif.
DYNAMIC STABILITY ANALYSIS OF DUCTED FAN TYPE FLYING PLATFORMS, by R. N. Greenman and M. G. Gaffney. Rept. on Contract Nonr-1357(00), Phase IV. 29 May 59, 164p. 7 refs. Rept. no. ARD-233.
Order from LC mi$7.80, ph$25.80 PB 146 029

An analysis is presented of the longitudinal dynamic stability characteristics in hovering and in level low-speed flight ($\lambda \leq .12$), of the Hiller 7-foot diameter ducted fan flying platform. In addition, several configuration variations were investigated, including duct section and chord, number of propeller blades, propeller blade setting, and clearance between tips of propellers and inside of duct. The equations of motion are developed using standard methods. Time histories, obtained with an analog computer, and the resulting stability parameters are presented graphically. The present gyrobar stabilizer system provides sufficient damping in hovering flight but will not overcome the divergent motion in forward flight. For this reason, the dynamic characteristics deteriorate with increasing speed. This is primarily due to the static (angle-of-attack) instability which occurs at higher speeds. (Author)

Hiller Aircraft Corp., Palo Alto, Calif.
WIND TUNNEL TEST OF SEVERAL DUCTED PROPELLERS IN NON-AXIAL FLOW, by W. J. Gill. Rept. on Contract Nonr-1357(00), Phase IV. 20 Apr 59, 397p. 10 refs. Rept. no. ARD-224.
Order from LC mi$11.10, ph$60.60 PB 146 176

Wind tunnel and static tests were conducted on various ducted propellers of 2.0 foot diameter. Measurements were made of the total aerodynamic forces and moments, the forces and moments acting on the duct itself, and the power supplied to the propellers. The model was tested at advance ratios (tunnel airspeed/propeller tip speed) of 0, 0.05, 0.10 and 0.15 with the duct axis tilted through a range of angles between 0 and 90 degrees. Detailed velocity surveys were conducted in the slipstream, and vanes mounted in the slipstream were tested. In addition, centerbodies of the type used in flying platforms were investigated. Four ducts were tested in combination with three different sets of contra-rotating, adjustable pitch propellers. The data are presented in the form of coefficients based on propeller tip speed, duct area and propeller radius, except for the duct alone (ring wing) data, for which the coefficients are based on tunnel airspeed. Slipstream flow survey data are presented in tabular form.

Kaman Aircraft Corp., Bloomfield, Conn.
KRC-4 ROTOCHUTE DEVELOPMENT, by C. B. Packard. Final rept. on Contract Nonr-901(00). 1 Aug 58, 160p. 10 refs. Rept. no. R-239.
Order from LC mi$7.50, ph$24.30 PB 146 103

The following are summarized: development of a Rotochute design that is ready for service evaluation; development of a tactical prototype vehicle with multiple, interchangeable containers; demonstration of dynamically stable descent at a rate of 53 feet per second for 100-pound payload, and 58 feet per second for 200-pound payload; establishment of a minimum release altitude of 300 feet to develop terminal descent; demonstration of successful deployment of the KRC-4 Rotochute from the P2V-7 aircraft at speeds up to maximum attainable (250 knots); and deployment and operation of the companion Rotochute (KRC-4A) at 1070 feet per second (Mach .99) in a near vertical attitude at 4174 feet altitude.

Institute of Flight Structures, Columbia U., New York.
STRESS FUNCTIONS WITH AXIAL SYMMETRY IN HETEROGENEOUS BODIES, by M. B. Friedman and J. L. Sackman. Technical rept. no. 7 on Contract Nonr-266(34). Apr 59, 13p. 2 refs. CU-1-59-ONR 266(34)-CE; AD-225 390.
Order from LC mi$2.40, ph$3.30 PB 145 800

The use of stress functions are extended to the analysis of visco-elastic phenomena involving variable material properties. The results are also applicable to

elasticity problems with non-constant properties. The case of axial symmetry is considered in both cylindrical and spherical coordinates.

Naval Weapons Lab., Dahlgren, Va.
QUALIFICATION OF POWER CARTRIDGES, TALCO P/N-1000-121 FOR F8U-1 AIRCRAFT CANOPY REMOVER, by J. P. Matarrese. 4 Feb 60, 44p. 7 refs. NWL rept. no. 1685.
Order from LC mi$3.30, ph$7.80 PB 145 777

The power cartridge for use in the F8U-1 canopy remover was evaluated in accordance with applicable sections of MIL-D-21625 and Chance Vought Aircraft Incorporated Specification CVA 1202C. Final release of the cartridge to service for use within the operational temperature range of -65°F to +160°F is recommended. The functions of the evaluated cartridges in the canopy removal system and the test procedures, instrumentation and methods of data analysis employed in the evaluation are described. (Author)

Purdue Research Foundation, Lafayette, Ind.
A SURVEY OF GERMAN HOLLOW TURBINE BLADE DEVELOPMENT. PART I: INITIAL INVESTIGATIONS AND DEVELOPMENTS, by E. N. Petrick. Rept. on Contract W33-038-ac-17625. Oct 49, declassified 26 Mar 51. 222p. 39 refs. ATI-79 552; 102-AC-49/14-23.
Order from LC mi$9.90, ph$34.80 PB 146 852

This report is the first in a series of three dealing with German developments in the field of turbine blade cooling, with particular emphasis on the use of air-cooled hollow turbine blades. The current report contains (a) a discussion of the various methods of turbine cooling considered by the Germans, (b) information on the initial investigations and developments, and (c) methods of improving internal blade cooling.

SKF Industries, Inc., [Philadelphia, Pa.]
ENDURANCE TESTS OF ROLLING CONTACT BEARINGS OF CONVENTIONAL AND HIGH TEMPERATURE STEELS UNDER CONDITIONS SIMULATING AIRCRAFT GAS TURBINE APPLICATIONS, by H. O. Walp, R. P. Remorenko, and J. V. Porter. Rept. for Feb 53-Feb 58 on Contract AF 33(600)22860. July 59, 87p. WADC Technical rept. 58-392; AD-212 904.
Order from OTS $2.25 PB 161 672

Endurance tests of rolling contact bearings of conventional and high temperature steels were conducted at two temperature levels and at normal and high speeds. Test results indicate that the fatigue life of the high temperature steels is materially increased by vacuum melting. High speed ball bearings, alike in all respects except for ball diameter variations, were tested at high speed to study dimensional effect on endurance life. Results of the endurance tests indicate no correlation of individual bearing life with observed dimensional variations for the same bearings. To provide a means of determining the fatigue properties of materials without using complete bearings, simple specimen testing machines were designed and operated. (Author)

Systems Technology, Inc., Inglewood, Calif.
THE DETERMINATION OF LATERAL HANDLING QUALITY REQUIREMENTS FROM AIRFRAME-HUMAN PILOT SYSTEM STUDIES, by Irving L. Ashkenas and Duane T. McRuer. Rept. on Contract AF 33(616)5661. June 59, 90p. 57 refs. WADC Technical rept. 59-135; AD-212 152.
Order from OTS $2.25 PB 161 538

Pilot describing functions and airframe transfer functions are combined within a servo analysis framework to develop a partial theory of lateral handling qualities. Tentative criteria for certain roll/aileron transfer function quantities are derived and compared with existing pilot opinion data to establish limited regions of validity. The report contains a summary of pilot dynamic capabilities in closed loop tasks, airframe lateral transfer function characteristics and parameters, and current dynamic lateral handling qualities requirements and data. (Author)

Chemical Engineering

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
DESIGN STUDY OF HIGH PRESSURE OXYGEN VESSELS, by Donald A. Keating. Rept. for Sep 58-May 59 on Equipment for Life Support in Flight Operations. Feb 60, 28p. 9 refs. WADC Technical rept. 59-767.
Order from OTS $0.75 PB 161 666

The feasibility of storing gaseous breathing oxygen under extreme high pressures for life support in flight operations is investigated. The method of solution is theoretical in nature utilizing both analytic and graphic techniques. In general, high pressure oxygen storage vessels utilizing an internal pressure at approximately 7500 psia were found to be theoretically superior on a weight-volume basis to standard liquid oxygen converters for missions of moderate duration. The optimum internal pressure is based on the minimum mathematical product of vessel weight and volume, and is dependent upon the strength characteristics of the vessel material. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
AIRCRAFT-TRACKING COLORED-SMOKE MARKER, by Woodrow W. Reaves and Kenneth G. Carlon. Rept. for May 55-Oct 57 on Dissemination Research on CW Agents. Jan 60, 24p. CWLR 2338; AD-231 129.
Order from LC mi$2.70, ph$4.80 PB 146 061

Investigation for the Navy of a smoke tracking device to aid in visual tracking of guided missiles and rockets during test flights resulted in the development of a marker designated the E24 aircraft-tracking red-smoke marker. This marker is essentially a pair of smoke canisters mounted in a pod suspended from the

wing racks of an aircraft. The pyrotechnic composition of the marker consists of the following: red dye, 57.0 parts by weight; potassium chlorate, 25.0 parts by weight; and thiourea, 18.0 parts by weight. This formulation was tested in an aircraft traveling at a speed of 570 knots at an altitude of 30,000 feet or higher, and produced a clearly visible smoke trail for approximately 3 minutes.

Army Chemical Warfare Labs., Army Chemical Center, Md.
DEVELOPMENT TESTING OF PORTABLE DECONTAMINATING APPARATUSES: E17R1, 1-1/2-QUART (NONEXPENDABLE) AND E18, 1-QUART (EXPENDABLE) by John H. Buddemeyer and M. F. Gilchrist. Aug 59, 33p. 11 refs. CWLR-2302.
Order from LC mi$3.00, ph$6.30 PB 146 058

The object was to develop a small improved decontaminating apparatus which would meet prescribed military/technical characteristics. This report concerns the development testing of the nonexpendable Decontaminating Apparatus, and the attempted development of the expendable Decontaminating Apparatus. The unit, designed for mounting on vehicular-type equipment, was to serve for decontaminating the essential components of these systems to a degree where continuous operation was assured. Conclusions: The E17R1 unit meets the prescribed military/technical characteristics for an improved small decontaminating apparatus, and is a satisfactory development prototype for final engineering testing. A prepressurized apparatus such as the E18 is not feasible when used with DS2 solution if operation is required over a wide temperature range.

Army Chemical Warfare Labs., Army Chemical Center, Md.
GAS-AEROSOL FILTER MATERIAL PILOT PLANT, by Morris Thompson and Bernard J. Bruns. Sep 59 217p. CWLR-2297.
Order from LC mi$9.60, ph$33.30 PB 146 171

This report covers the relocation of the filter material pilot plant from Pittsburgh, Pennsylvania, to the Army Chemical Center, Maryland, the modifications to this plant and the changes to the dry process for making Gas-aerosol filter material for the M17 field protective mask. The pilot plant was relocated, modified, and operated to make changes to and to gather data on the dry process.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
THERMAL PARAMETERS ASSOCIATED WITH IGNITION OF THE MAGNESIUM-BARIUM NITRATE SYSTEM, by Martin Gilford and Saul Gordon. Mar 60, 27p. 11 refs. Technical notes no. 43.
Order from LC mi$2.70, ph$4.80 PB 144 830

The effects of the thermal blanketing technique and of high-humidity storage on the ignition behavior of the magnesium-barium nitrate system have been investigated.

Indiana U., Bloomington.
A DIGITAL PULSE INTEGRATOR FOR FLASH INTENSITY MEASUREMENTS, by Henry H. Kramer and Edward J. Bair. Rept. on Contract AF 18(603)93. 29 Aug 58, 13p. 3 refs. AFOSR-TN-58-777; AD-201 925.
Order from LC mi$2.40, ph$3.30 PB 138 173

A digital pulse integrator is described for measuring the voltage-time area of electrical impulses such as the photocurrent resulting from the photoelectric observation of a xenon flash source. As the basis of its operation, the positive pulse to be integrated charges a capacitor. A decade scaler then counts the number of smaller negative pulses from a crystal oscillator that are required to discharge the capacitor to its original voltage.

Willow Run Labs., U. of Michigan, Ann Arbor.
THE PHASE DIAGRAM FOR THE BINARY SYSTEM CADMIUM-TELLURIUM, by Donald R. Mason and Bernard M. Kulwicki. Rept. on Project Michigan, Contract DA 36-039-sc-78801. Apr 60, 33p. 13 refs. 2900-139-R.
Order from LC mi$3.00, ph$6.30 PB 146 870

The phase diagram for the cadmium-tellurium system has been redetermined by measuring the thermal behavior of representative compositions in the system by the method of differential thermal analysis. The experimental details and the resulting data are described and discussed. Thermodynamic analysis shows that the system CdTe-Te appears to form an ideal solution. The latent heat of fusion of CdTe is estimated to be 10,700 cal/gm mol. The system Cd-CdTe is an elementary solution and has a relatively large excess partial molar entropy of solution and a large partial molar enthalpy of solution. These partial molar qualities are independent functions of composition, but not of temperature. The eutectic compositions have been determined as 10^{-6} atom-fraction Te and about 0.99 atom-fraction Te. The validity of this work vis-a-vis that of other investigators is discussed. (Author)

Civil Engineering

Bureau of Yards and Docks, Washington, D. C.
CONSTRUCTION BATTALION ADMINISTRATION. 1 Aug 53, 32p. 28 refs. Technical pub. NAVDOCKS TP-Ad-7.
Order from LC mi$3.00, ph$6.30 PB 139 135

Described herein are the authority and responsibilities of the Bureau of Yards and Docks for technical and management control matters related to the Naval Construction Forces, followed by a short history of the Seabees. The types of Naval Construction organizations are described and the military aspects and command relationships are outlined. Information also is presented on types of assignments, personnel administration, correspondence, records and reports, military justice, supply and disbursing, and training. This publication does not give detailed instructions for handling administrative matters.

Illinois U., Urbana.
REVIEW OF THE LITERATURE PERTAINING TO THE BEHAVIOR AND DESIGN OF DEEP STRUCTURAL MEMBERS, by W. J. Austin and W. Egger. Technical note on Contract AF 29(601)468. June 58, 52p. 80 refs. AFSWC-TN-59-8; AD-211 213.
Order from LC mi$3.60, ph$9.30 PB 145 731

A comprehensive literature survey into the field of deep beams. Reinforced-concrete deep beam theory. Data can be used as a guide in organizing future testing. Moment-shear interaction in medium-thick beams (1:6 ratio), from which information on web reinforcement was obtained. Response of small-scale beams of conventional length depth ratios to impact loading. Behavior of deep steel members.

Mathematics Research Center, U. of Wisconsin, Madison.
A SURVEY OF THE LITERATURE ON THE THEORY OF THIN-WALLED BARS, by J. Nowinski. Rept. on Contract DA 11-022-ORD-2059. Oct 58, 39p. 133 refs. MRC Technical summary rept. no. 57; AD-207 995.
Order from LC mi$3.00, ph$6.30 PB 145 872

Stanford U., Calif.
INVESTIGATION OF SHEAR WALLS. PART 9: CONTINUED EXPERIMENTAL AND MATHEMATICAL STUDIES OF REINFORCED CONCRETE WALLED BENTS UNDER STATIC SHEAR LOADING, by Jack R. Benjamin, and Harry A. Williams. Technical rept. no. 7 on Contract DA 49-129-eng-193. 1 Sep 55. 126p. 8 refs. AFSWP 888.
Order from LC mi$6.30, ph$19.80 PB 137 986

A study to determine an efficient way of strengthening walls with openings resulted in recommendations for the addition of diagonal corner bars well anchored in the edge members of the wall. In panel reinforcing localized reinforcing patterns were no better than uniform horizontal and vertical steel. A limited study was made to determine the resistance of walls to combinations of shear load in the plane of the wall and forces perpendicular to a face. (See also PB 137 465)

Stanford U., Calif.
INVESTIGATION OF SHEAR WALLS. PART 10: LIMITED STUDY OF BRICK AND CONCRETE BLOCK SHEAR WALLS WITH STEEL FRAME, by Jack R. Benjamin, Harry A. Williams and others. Technical rept. no. 8 on Contract DA 49-129-eng-193. Sep 56, 54p. 7 refs. AFSWP 889.
Order from LC mi$3.60, ph$9.30 PB 137 987

This report gives results of a limited investigation of brick and concrete block shear walls, with and without openings, and enclosed in a steel frame. Rough methods of predicting the load-deflection characteristics of such walls are given. (See also PB 137 986)

Airborne Instruments Lab. [Melville] N. Y.
APPLICATION OF SEMICONDUCTOR DIODES TO MICROWAVE LOW-NOISE AMPLIFIERS AND HARMONIC GENERATORS, by J. C. Greene, E. Kraemer, and others. Quarterly progress rept. no. 3, 1 Jan-31 Mar 59, on Contract DA 36-039-sc-78161. 15 Apr 59, 23p. 5 refs. Rept. no. 5872-I-3.
Order from LC mi$2.70, ph$4.80 PB 145 807

Preliminary experimental results are presented on the operation of a microwave third-harmonic generator. In the experimental model, the input signal frequency is about 1000 Mc, and the impedances presented to the fundamental, second, and third harmonic currents are independently variable. The inability to obtain the large predicted values of gain-bandwidth products at higher operating frequencies is tentatively attributed to diode lead inductance. (See also PB 142 622)

Airborne Instruments Lab., Melville, N. Y.
APPLICATION OF SEMICONDUCTOR DIODES TO MICROWAVE LOW-NOISE AMPLIFIERS AND HARMONIC GENERATORS, by J. C. Green, E. Kraemer, and others. Final progress rept. 30 June 58-30 June 59, on Contract DA 36-039-sc-78161. 15 July 59, 70p. 22 refs. Rept. no. 5872-1; AD-225 845.
Order from LC mi$3.90, ph$10.80 PB 145 806

A theory for the maximum achievable voltage gain-fractional bandwidth product of one-port and two-port difference frequency reactance amplifiers has been worked out. Low-frequency and microwave experiments indicate good agreement between theoretical and measured values. The noise figure of a reactance amplifier designed in this manner is nearly optimum. (See also PB 145 807)

Battelle Memorial Inst., Columbus, Ohio.
LABORATORY TEST PROCEDURES FOR PREDICTING THE TROPICAL-SERVICE LIFE OF ELECTRONIC COMPONENTS AND MATERIALS, J. L. Easterday, A. E. Mace, and W. E. Chapin. Final summary rept. for 1 Sep 54-31 Mar 59 on Contract DA 36-039-sc-64518. 31 Mar 59, 122p. 20 refs. AD-226 309.
Order from OTS $2.75 PB 161 692

This report contains the summarized base-line data obtained from over 3 years' exposure to tropical environments for a wide variety of electronic components. Several laboratory investigations were conducted; the results of this work have been analyzed and correlated to the base-line data obtained from the tropical exposures. Acceleration factors relating laboratory investigations to the tropical exposures have been formulated and are presented.

Bell Telephone Labs., New York.
SUBMINIATURE FIXED CAPACITORS, by D. A. McLean, H. G. Wehe, and J. K. Werner. Final rept. for 1 July 55-30 June 57 on Contract DA 36-039-sc-64695. June 57, 68p. 4 refs. Rept. no. 26286-G; AD-156 911.
Order from LC mi$3.90, ph$10.80 PB 145 979

Final models of both grade 1 and 2 capacitors were completed and delivered along with drawings and specifications. The original purpose for grade 1 capacitors for 1-mc use was achieved except that the tan δ requirement was applied at 200 kc instead of 1 mc. The original requirements of tan δ = 0.0015 max were achieved or closely approached. A practicable design was established for subminiature, supported-film, fixed capacitors with mica-like properties for use in LV transistor circuits. Using polystyrene lacquer supported by metallized strips of paper, a capacitance of >25,000 µµf was placed in a volume of 0.03-cu in. with no dimension greater than 5/8 inch. The complete original purpose for grade 2 capacitors was not achieved. Tan δ requirements were readily met, but the capacitance was low if the IR was satisfactory, and vice versa. An alternate film was used, a stripped lacquer film of cellulose acetate, with new objectives of 0.15 µf minimum, tan δ of 0.02 max at 1 kc, in 0.03 cu inch. With this film, the new objectives were completely achieved. The capacitance was 0.23 µf, tan δ was less than 0.02 at 1 kc (and less than 0.03 at 100 kc.). The initial IR's at 50-v dc were greater than 1000 ohm-farads, the median IR being 20,000 ohm-farads at room temperature. Capacitors showed satisfactory life-test performance at 100-v dc (twice rated voltage) at temperatures between -55°C and 65°C for periods exceeding 440 hr.

Bright Star Industries, Clifton, N. J.
FLAT CELL MAGNESIUM DRY CELL BATTERIES, by F. A. Keller. Semi-annual progress rept. no. 1, 30 Sep 58-31 Mar 59, on Contract DA 36-039-sc-78231. [1959] 12p.
Order from LC mi$2.40, ph$3.30 PB 145 803

The dimensions and design for the flat Magnesium "N" cell and its components have been established. All tools are satisfactory except the stellite die and punch for the mix cake.

Centre de Physique Eléctronique et Corpusculaire (France).
WIDE DYNAMIC RANGE BARRIER GRID STORAGE TUBE T.C.M. 16, by G. Wendt. Rept. on Proj. NR-048-140. 31 May 59, 21p. W.R. 406; AD-218 425.
Order from LC mi$2.70, ph$4.80 PB 146 261

In the first part of the present report we will describe the technological improvements made on the TCM 16 gun. We were able through them to get stable characteristic curves which showed the required current linearity. In the second part we studied the formation of the electron beam in such a gun. With an electrolytic tank fields have been plotted and rays traced. Moreover a tube having a metallic target with a slit allowed us to see how the spherical aberration did depend upon the nature of the focusing lens, either electrostatic or magnetic. In the third part we describe the tests made with that gun shooting on a memory target of our usual type. (See also PB 145 585)

Chatham Electronics, Livingston, N. J.
DEVELOPMENT AND EVALUATION OF ELECTRON TUBE GLASSES RESISTANT TO RADIATION DAMAGE, by G. R. Weinberg. Final rept. for 1 May 58-30 Apr 59 on Contract DA 36-039-sc-75065. [1959] 26p. AD-220 199.
Order from LC mi$2.70, ph$4.80 PB 146 041

Enclosures made of various glass without leads and with matching leads sealed-in were exposed to an integrated thermal neutron flux of 10^{16}NVT. Except for glass type 7052, no damage besides discoloration could be noticed. The 7052 glass with sealed-in molybdenum leads cracked when exposed to an integrated thermal neutron flux of 10^{16}NVT. Type 7720 glass with sealed-in tungsten leads cracked when exposed to an integrated thermal flux of 10^{17}NVT.

Clevite Transistor Products, Waltham, Mass.
RESEARCH AND DEVELOPMENT OF GERMANIUM PNP JUNCTION SWITCHING TRANSISTORS, by Paul L. Meretsky. Quarterly progress rept. no. 3, 10 Dec 58-9 Mar 59, on Germanium High Current NPN or PNP Junction Switching Transistor, Contract DA 36-039-sc-75060. [1959] 26p; AD-218 663.
Order from LC mi$2.70, ph$4.80 PB 145 876

Approximately fifty germanium PNP transistors meeting all electrical specifications of SCL-5522 were on hand. Measurements indicate that reliable hermetic enclosures have resulted. (See also PB 142 760)

Clevite Transistor Products, Waltham, Mass.
RESEARCH AND DEVELOPMENT OF GERMANIUM PNP JUNCTION SWITCHING TRANSISTORS, by Paul L. Meretsky. Quarterly progress rept. no. 4, 10 Mar-9 May 59, on Germanium High Current NPN or PNP Junction Switching Transistor, Contract DA 36-039-sc-75060. [1959] 30p.
Order from LC mi$2.70, ph$4.80 PB 146 167

The work continued along the lines of solving the burnout problem. At present it appears that the lowest possible resistivity combined with the widest possible alloyed base width leads to fewer burnouts in the switching test. (See also PB 142 760)

David Sarnoff Research Center, Princeton, N. J.
HIGH-TEMPERATURE SEMICONDUCTOR DEVICES, by A. Amith, L. Ekstrom and others. Scientific rept. for 15 Feb 57-30 Sep 59 on Contract AF 33(616)5029. 31 Oct 59, 131p. 63 refs. AFCRC-TN-60-134.
Order from OTS $2.75 PB 161 541

Purification, crystal growth, and evaluation of the compounds, GaAs and InP. Determination of Impurities in GaAs, Diffusion in GaAs and InP, and Minority Carrier Lifetime in GaAs. Fabrication of diodes, rectifiers, and transistors of both GaAs and InP. Large single crystals of GaAs and InP have been prepared by four different growth techniques with low

dislocation densities and with no lineage. Purification techniques have been devised by which arsenic, phosphorus, and gallium are prepared with a purity of about 99.9999%. Single crystal growth of arsenic from the melt, the distillation of arsenic from lead-arsenic alloys, the vacuum annealing of gallium with a cold "finger", single crystal growth of gallium, and chemical and physical treatments of phosphorus. The diffusion of indium and phosphorous in InP was studied using radioactive tracers of these elements. Photoconductance and the photoelectromagnetic effect have been measured over the temperature range 80°K-300°K with a view toward learning the lifetime of minority carriers. The basic technology important to the fabrication of most known devices has been demonstrated in GaAs and InP. This includes point contacts, metal semiconductor contacts, and alloy and diffusion junctions. Devices such as the microwave diode, parametric amplifier, large and small signal rectifiers, tunnel diode, and unipolar transistor have been successfully made.

Diamond Ordnance Fuze Labs., Washington, D. C.
EFFECTS OF PULSED NUCLEAR RADIATION ON NONOPERATING TUBES AND TRANSISTORS, by Herbert G. Chandler. 20 Nov 59, 20p. 4 refs. Technical rept. TR-795; AD-230 237.
Order from LC mi$2.40, ph$3.30 PB 146 077

During Operation Hardtack electron tubes of both ceramic and glass construction and transistors were exposed to nuclear radiation while they were not functioning. These components were subjected to neutron bombardment as great as 4×10^{14} Pu^{239} nvt. No deleterious effects on the electron tubes were observed under these conditions. However, measured transistor parameters suffered large percentage changes from radiation greater than 3×10^{13} Pu^{239} nvt. These effects were much greater in audio than in RF types. (Author)

Diamond Ordnance Fuze Labs., Washington, D. C.
PHASE SYNCHRONIZATION OF SUPERREGENERATIVE OSCILLATIONS, by H. G. Fritz. 28 Dec 59, 20p. 3 refs. Technical rept. TR-780; AD-231 044.
Order from LC mi$2.40, ph$3.30 PB 146 079

Pulsed continuous-wave and absolutely periodic oscillator spectra are discussed with emphasis on line position. Experimental pulsed continuous-wave spectra are shown. The superregenerative phase-synchronized spectrum is derived. It is shown that the spectral lines for a superregenerative oscillator controlled by an external signal occur about the signal frequency regardless of the oscillator frequency and regardless of changes in this frequency during the quench pulse. This effect is attributed to synchronization of the oscillator starting phase with the external signal. Experimental spectra are used to illustrate this principle. The difference between phase synchronization and locking is stressed. Photographs of spectra for a locking CW oscillator are shown. (Author)

Diamond Ordnance Fuze Labs., Washington, D. C.
STATUS OF ELECTRONIC MICROMINIATURIZATION: FEBRUARY 1960, by Norman J. Doctor. 4 Mar 60, 29p. 31 refs. TR-823.
Order from OTS $0.75 PB 161 674

Major programs in electronic microminiaturization currently being pursued by educational, Governmental, and industrial laboratories are described. The techniques reviewed include: (1) welding of miniature commercial parts, (2) soldering of miniature commercial parts to miniature etched-wiring boards, (3) riser-wire connecting of wafer microelements, (4) printing of multicomponent circuits on single ceramic substrates and (5) forming of both integrated and functional solid circuits. An extensive bibliography is included. (Author)

Diamond Ordnance Fuze Labs., Washington, D. C.
THEORY OF THE GERMANIUM DIODE MICROWAVE SWITCH, by Robert V. Garver, John A. Rosado, and Edward F. Turner. 15 July 59, 14p. 13 refs. Technical rept. TR-747; AD-228 975.
Order from LC mi$2.40, ph$3.30 PB 146 060

The application of a generally neglected theory of microwave detection to the poorly understood problem of p-n semiconductor junction behavior at microwave frequencies is discussed. Experimental results are presented which appear to be the first direct experimental verification of the theory. The theory predicts that germanium microwave diodes should exercise direct switching action upon microwaves while silicon microwave diodes should not, as had been observed in the past but with no explanation. (Author)

Dielectrics Lab., Johns Hopkins U., Baltimore, Md.
A PRACTICAL INTERPRETATION OF DIELECTRIC MEASUREMENTS UP TO 100-MC, by J. J. Chapman and L. J. Frisco. Rept. on Contract DA 36-039-sc-73156. 31 Dec 58, 211p. 23 refs.
Order from OTS $3.50 PB 161 545

The rapid development of the electronics industry in recent years has brought about a demand for increased activity in the development of insulating materials and design techniques which can be applied to high-frequency problems. With the ever increasing demands of industry and the military for greater power output ratings from smaller units, the insulating material has become the critical part of many assemblies. The authors have made extensive investigations of the behavior of solid insulating materials over the frequency range of 60-cps to 100-mc. The primary objective of these studies was to determine the effects of frequency, temperature and moisture absorption on the electrical properties of representative insulating materials. Particular emphasis was placed on the measurement of electric strength at frequencies up to 100-mc. The purpose of this present report is to summarize all of the data in a convenient form and to discuss the results from a practical, rather than an academic viewpoint.

Eastman Kodak Co., Rochester, N. Y.
BASIC RESEARCH INVESTIGATIONS FOR AMMONIA VAPOR ACTIVATED BATTERIES, by J. M. Freund, V. M. Bryant, and J. B. Schliff. Quarterly progress

rept. no. 7, 15 Mar-14 June 59, on Contract DA 36-039-sc-74902. [1959] 21p. AD-226 662.
Order from LC mi$2.70, ph$4.80 PB 145 878

Data are given for the conductance of ammonia solutions of NH_4SCN at concentrations ranging between 6 mol% and 40 mol% NH_4SCN, at temperatures between -70°C. and +30°C. Preliminary data are presented for NH_4NO_3 and NaSCN solutions and on the effect of water or CO_2 additives to NH_4SCN solutions. Some information is also given on the vapor pressure of moderately concentrated NH_4SCN solutions, 8.3 and 13.2 mol%. These pressures are about 80% and 60%, respectively, of the pressure of pure ammonia at the same temperature. (Author) (See also PB 143 896)

Educational Research Corp. [Cambridge, Mass.]
A COMPARISON OF TWO METHODS OF TEACHING MORSE CODE, by Philip J. Rulon and W. Douglas Brooks. Rept. on Contract N61339-294. 11 Jan 60, 29p. 11 refs. Technical rept. NAVTRADEVCEN-294-2.
Order from LC mi$2.70, ph$4.80 PB 145 833

The results of this study indicate that with regard to speed, there is no difference between the groups at any time during the course of training. One method requires about the same length of time to increase the students' speeds to certain levels, whether this speed is 4, 10, 16 or 22 words per minute. At the end of 22 weeks of instruction, students taught by one method are just as fast and as accurate as students taught by the other. The only differences found were that during the early weeks of code training, the Robins method produced more accurate students than did the standard Navy method.

Eitel-McCullough, Inc., San Bruno, Calif.
EVALUATION OF UHF PLANAR TRIODE TUBE TYPE 2C39A IN THE POSITIVE GRID REGION. Final technical rept. for 15 Nov 57-15 Oct 58 on Contract DA 36-039-sc-74815. [1958] 35p. AD-225 985.
Order from LC mi$3.00, ph$6.30 PB 145 935

This work was undertaken to establish tube capabilities in the positive grid region and to provide data as a basis for setting test limits suitable for inclusion in a procurement specification. Long-pulse (4500 μs) tests in the positive-grid region were made on nine monthly, 10-tube samples of 2C39A tubes over a six-month period. Results were analyzed statistically and means and standard deviations are reported for each of the tests. No correlation was found between the long-pulse tests and the conventional tests of the MIL-E-1/546 TSS. (Author) (See also PB 142 994)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS, by A. Aharoni, R. Poeschel and others. Quarterly progress rept. no. 7, 1 Nov 58-28 Feb 59, on Contract DA 36-039-sc-73150. 31 Mar 59, 45p. 13 refs. AD-225 731.
Order from LC mi$3.30, ph$7.80 PB 145 936

Under Task A experiments were performed: (1) to improve upon the precision in the determination of the collision cross section, for momentum transfer, of water vapor molecules for slow electrons of a room temperature (300°K) electron gas; (2) to analyze the free electron loss processes as influenced by immersion in the volume of the gas container solid substances (quartz wool) in Helium and Argon discharges; (3) to investigate the gas dynamics in pulsed electrical discharges in rate gases of short duration moderate intensities. Under Task B research of semiconductor behavior in high level eight millimeter waves was continued. Previously observed spurious phenomena associated with the high level eight millimeter pulsed signals have been analyzed in detail and found to be due to a sizable second harmonic component of the (8mm) magnetron output. The elimination and/or use, as the case may be, of this harmonic component in the microwave pulsed signal will permit the development of a method by which changes in mobility and carrier concentration in both microwave fields can be determined. (Author) (See also PB 142 996)

Electron Tube and Microwave Lab., Calif. Inst. of Tech., Pasadena.
POWER FLOW AND GAP COUPLING TO SLOW WAVE PLASMA MODES, by Gary D. Boyd. Technical rept. no. 12 on Contract Nonr-220(13). June 59, 37p. 10 refs. AD-220 086.
Order from LC mi$3.00, ph$6.30 PB 146 516

The interaction impedance for the slow wave plasma modes of Trivelpiece and Gould is obtained for a coaxial system of plasma column, surrounding dielectric and conducting surface. The theory presented includes a finite axial magnetic field. Calculations are presented for the special case of no static magnetic field for the so-called surface wave interaction impedance versus βa. Coupling to the slow wave plasma modes by a known electric field across a gap in the conducting surface at the dielectric surface is analyzed for the coaxial plasma system including a static axial magnetic field. This results in an impedance as seen by the cavity gap. Calculations are presented for the special case of no static magnetic field. (Author) (See also PB 151 638)

Electronic Communications, Inc., Timonium, Md.
AUTOMATIC CONTROL OF RADIO FREQUENCY PHASE SHIFT, by S. N. Broady and R. G. Roush. Final rept. on Contract AF 19(604)2407. 31 Oct 59, 41p. 3 refs. AFCRC-TR-59-363.
Order from LC mi$3.30, ph$7.80 PB 145 757

The purpose of this report is to investigate and develop feed-back techniques to provide precision electronic control of phase shifter devices suitable for operation in the 200 to 1500 Mc/sec frequency band. Three phase control systems are discussed: The first, developed under another contract, provided the basis for the work described herein. The second, a refinement of this original system, was found to be unrealizable in this frequency range. The third and successful system can be realized conveniently at both UHF and microwave frequencies.

Electronic Defense Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
SPARE PARTS KITS AT MINIMUM COST, by Guy Black and Frank Proschan. Rept. on Contract DA 36-039-sc-75012. 13 Oct 58, rev. 4 Dec 59, 33p. 14 refs. Technical Memo. no. EDL-M154; AD-208 305.
Order from LC mi$3.00, ph$6.30 PB 146 876

The root of the problem is that spare parts consumption is a random process. Statistical records on electronic component failure indicate that often the rate of failure is quite constant during a large part of equipment life, meaning that an exponentially declining probability density function must be used to describe the probability that a component will survive a given number of hours.

Electronics Research Lab., U. of California, Berkeley.
SCATTERING BY A NONRESONANT SLOT IN A RECTANGULAR GUIDE, by N. Kusnezov. 10 Dec 58, 42p. 14 refs. IER Series no. 60, Issue no. 219. Rept. no. 76.
Order from LC mi$3.30, ph$7.80 PB 145 850

The approximate solution is explored for a thin slot in a rectangular wave guide as obtained by Stevenson (Jnl. of Applied Physics 19:24-38 (1948)), and later improved in this laboratory by Held (ERL rept. 27, PB 117 529). Although both theories treat the same problem, they arrive, in the case of a resonant slot, at answers which differ in form considerably.

Electronics Research Lab., U. of California, Berkeley.
SCHEME FOR IMPROVING BEAM-TUBE PERFORMANCE BY DEPRESSING COLLECTOR POTENTIAL, by J. W. Hansen. Scientific rept. no. 7 on Contract AF 19(604)2270. 15 Dec 59, 48p. 18 refs. IER Series no. 60, issue no. 260; AFCRC-TN-59-977.
Order from LC mi$3.30, ph$7.80 PB 145 767

The present state of the art of depressed-collector design is reviewed and the characteristics of various designs are discussed. A design is proposed with desirable characteristics of most present designs but without the common disadvantage of adding to the size and weight of the tube. The performance of the collector is evaluated experimentally and is found to be promising. The device is readily adaptable to a rugged, simple collector for a commercial tube. The possibility of modification of the design to include velocity sorting is discussed. (Author)

General Electric Co., Owensboro, Ky.
INVESTIGATION OF THE EFFECTS OF OPERATING CONDITIONS ON SUBMINIATURE ELECTRON TUBES, by M. W. Edwards. Final rept. for 1 July 56-1 July 58 on Contract DA 36-039-sc-73072. [1958] 807p. AD-217 415.
Order from LC mi$11.10, ph$122.70 PB 145 925

Bulb temperature proved to be most important variable interacting with plate voltage to result in electrolysis of glass. Filament voltage ranks next to bulb temperature in importance and has more effect on slumping characteristics and less effect on electrolysis. Plate voltage has an important effect on electrolysis. Plate wattage as applied in this project had an important effect on the 6021 only, and was discarded as unimportant on all other types. Heater-cathode voltage as applied was discarded as unimportant on all types. The 5840 and 6021 display great tolerance to shock, whereas the 1AD4 and 6088 show good tolerance. The T3-Cathode type subminiatures are superior to Filamentary Cathode types. Folded Heaters are indicated to be somewhat superior to coil heaters. Electrolysis of the glass envelope opposite opening in the plate will cause early life slump. Statistical analysis has developed a figure of merit which is a valuable tool.

General Electric Co., Schenectady, N. Y.
DEVELOPMENT OF RUGGEDIZED HIGH TEMPERATURE CERAMIC UHF TUBES OF PLANAR GEOMETRY, by R. E. Manfredi and K. R. MacNaughton. Final rept. for 1 July 57-31 Oct 58 on Contract DA 36-039-sc-74859. [1958] 124p.
Order from LC mi$6.30, ph$19.80 PB 145 879

This report summarizes a program for development and/or evaluation of three ruggedized high temperature ceramic UHF tubes of planar geometry. The program included (a) design and construction of a six-stage, 500-MC amplifier for circuit evaluation of Type Z-2389 Triode as a preamplifier, (b) evaluation of Type Z-1910 Triode as a frequency doubler from 500 MC to 1000 MC and as an intermediate amplifier at 1000 MC, (c) development of Type Z-5192 Tetrode and its evaluation as a power amplifier, and (d) simultaneous demonstration of the above three tube types in a single test gear. (Author)

General Electric Co., Schenectady, N. Y.
PACKAGED VOLTAGE TUNABLE MAGNETRON, by R. G. Lock and M. Bessarab. Final rept. for 1 Mar 57-30 June 58 on Contract DA 36-039-sc-73125. [1958] 127p. 27 refs. AD-214 732.
Order from LC mi$6.30, ph$19.80 PB 145 934

A study was made of microwave circuits for voltage tunable magnetrons. Experimental results are presented for broad and narrow bandwidths at S-band. Design construction and packaging of a prototype voltage tunable magnetron oscillator was accomplished in the initial phase utilizing a Z-5112 VTM. Refined units using a Z-5299 VTM were supplied as the final units. Test data, sketches and photographs are contained in the report. (Author)

General Electric Co., Syracuse, N. Y.
70-AMPERE HIGH POWER SILICON CONTROLLED RECTIFIER, RESEARCH AND DEVELOPMENT PROGRAM, by G. N. Hall and R. P. Lyon. Quarterly progress rept. no. 1, 19 Jan-19 Apr 59, on Contract DA 36-039-sc-78278. [1959] 98p. 6 refs.
Order from LC mi$5.40, ph$15.30 PB 145 816

Junction feasibility studies have been completed and the alloy-diffused process has been chosen for fabrication. Test equipment includes: life test, forward

drop and thermal resistance, constant current, turn-off time, and PIV, VBO, gate test. Schematics and photographs of these equipments are presented.

General Electric Co., Syracuse, N. Y.
70-AMPERE HIGH POWER SILICON CONTROLLED RECTIFIER, RESEARCH AND DEVELOPMENT PROGRAM, by C. N. Hall and R. P. Lyon. Quarterly progress rept. no. 2, 19 Apr-18 July 59, on Contract DA 36-039-sc-78278. [1959] 40p. 12 refs.
AD-227 721.
Order from LC mi$3.00, ph$6.30 PB 145 815

This report includes: Two-terminal asymmetrical and symmetrical silicon negative resistance switches, by R. W. Aldrich and N. Holonyak, Jr. Phase-controlling kilowatts with silicon semiconductors, by F. W. Gutzwiller. The larger area silicon PNP pellet (.500" dia.) and emitter (.410" dia.) are being employed in the fabrication of the ZJ-70B silicon controlled rectifier. Evaluation of this junction is not complete, but fabrication feasibility and improved characteristics were demonstrated. A preliminary investigation on turn-off time was performed. This investigation was designed to probe the dependency of recovery times on structure geometry. The operating life test of five 100 volt cells has reached 500 hours with no failures. Thermal fatigue tests are in progress. Preliminary data is available. (Author) (See also PB 145 816)

General Mills, Inc., Minneapolis, Minn.
PARABALLOON ANTENNA MATERIALS STUDY, by J. H. Nash, F. J. Bollag and others. Rept. on Contract AF 30(602)1940. 1 Dec 59, 93p. 1 ref. General Mills Rept. no. 1915; RADC-TR-59-233.
Order from LC mi$5.40, ph$15.30 PB 145 835

There is currently considerable interest in the development of large, portable radar antennas. One approach which has shown some promise is the paraballoon antenna. This study deals with the development of a material suitable for application to the fabrication of paraballoon antennas.

General Radio Co., Cambridge, Mass.
FREQUENCY CONTROL SYSTEMS, by R. W. Frank and R. W. Stuart. Quarterly progress rept. no. 4, 1 Feb-1 Aug 53, on An Investigation of Circuits for the Purpose of Crystal Elimination, Contract DA 36-039-sc-15542. Aug 53, 71p. 2 refs.
Order from LC mi$4.50, ph$12.30 PB 137 908

The aim of this research is to develop a system which will permit the elimination of many quartz crystals which are currently used to control communication channel frequencies. The initial objective was to investigate two possible systems: one using multiples of phase-locked oscillators, and the second using one phase-locked oscillator driving a present continuously operating divider circuit. The second system was chosen on the basis of the work of the first three report periods. It is our purpose now, therefore, to evaluate the chosen system; and to engage in design refinements which will reduce the ideas reported here, and before, to practice for possible end-item manufacture. (Author) (See also PB 139 395, PB 142 534)

General Radio Co., Cambridge, Mass.
FREQUENCY CONTROL SYSTEMS, by R. W. Stuart. Quarterly progress rept. no. 7, 1 Feb-1 Sep 54, on [Investigation of Circuits for the Purpose of Crystal Elimination] Contract DA 36-039-sc-15542. Sep 54, 28p. 5 refs.
Order from LC mi$2.70, ph$4.80 PB 137 907

The program scheduled in the Fifth Quarterly progress report for the redesign of the scale-of-"N" counter has been completed. The three decades of the counter have been redesigned with principal emphasis on reliability, economy of power supply requirements and component totals, and the inclusion of ten-position rotary switching on all decades. The control circuits for the scale-of-"N" counter have undergone major revisions resulting in considerable reduction in complexity.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
HIGH FREQUENCY CRYSTAL-CONTROLLED OSCILLATOR CIRCUITS, by William A. Edson. Progress rept. no. 9 on Contract W36-039-sc-36841. 10 Aug 50, 28p. 7 refs.
Order from LC mi$2.70, ph$4.80 PB 137 869

The use of mutual inductance to compensate the crystal shunting capacitance has been reduced to practice in several oscillator circuits, and complete design procedures have been evolved, thus bringing this particular problem to a satisfactory completion. A convenient and accurate procedure for designing single layer solenoid transformers to meet specified inductance and coupling values, which has resulted from this work, is also applicable to a wide variety of problems involving radio frequency transformers. Existing theory with respect to Class C operation of triodes and pentodes has been adapted to the present problem.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
HIGH FREQUENCY CRYSTAL-CONTROLLED OSCILLATOR CIRCUITS, by William A. Edson. Progress rept. no. 10 on Contract W36-039-sc-36841. 10 Nov 50, 26p. 8 refs.
Order from LC mi$2.70, ph$4.80 PB 137 868

The use of inductance in series with crystals has been studied on a general basis. This work is an extension of the quarter-wave line concept as applied to the impedance-inverting oscillators, and indicates that under favorable circumstances impedance higher than that given by the quarter-wave line may be obtained. This advantage is realized, however, at the expense of frequency stability. The work on Class C operation has been continued, and a convenient design procedure for use with the grounded-grid oscillator has been evolved. Quantitative relationships are presented; their use in oscillator design is illustrated and experimentally confirmed. Additional work has been done on electron-coupled circuits for frequency multiplication. (See also PB 137 869)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STUDY PROGRAM FOR INVESTIGATION TO AID IN REDUCTION AND PREVENTION OF UHF INTERFERENCE, by Floyd P. Holder, Henry W. Mauldin, Jr. and others. Technical rept. no. 3, phase 3, on Contract AF 30(602)673. 1 Oct 55, 174p. 50 refs.
[RADC TR-56-89; AD-97 735]
Order from LC mi$8.10, ph$27.30 PB 137 653

This report presents the results of investigating the interference-reduction possibilities of modes of modulation and detection other than double-sideband amplitude modulation, polyphase modulation, and synchronous and polyphase detection as filtering techniques for the alleviation of common- and adjacent-channel interference. Reducing the carrier components of the amplitude-modulated signal reduces the interference generated within non-linear circuits. (See also PB 135 248)

Hughes Aircraft Co., Culver City, Calif.
DEVELOPMENT OF NARROW-BAND BANDPASS FILTERS WITH CENTER FREQUENCIES IN THE RANGE OF 10-60 MC, by Leo Storch. Interim final rept. on High Frequency Crystal Filters, Contract DA 36-039-sc-73070. Mar 58, 108p. 20 refs. Rept. no. 73070-1-F; AD-202 077.
Order from LC mi$5.70, ph$16.80 PB 146 561

The design theory for Type NB bandpass crystal filters is presented. The pertinent design equations for three-, five-, and seven-crystal filter sections of this type are given. The "Appendix B technique" is discussed in detail. The test results for five different Type NB filters are summarized. A self-contained design theory for bandpass ladder crystal filters is presented. Test results for a four-crystal ladder filter are given. The present status of the filter crystal art in the frequency range of interest is discussed. Suggestions for further work in the area of high-frequency, relatively narrow-band, bandpass filters are appended. (Author) (See also PB 146 564)

Hughes Aircraft Co., Culver City, Calif.
DEVELOPMENT OF NARROW-BAND BANDPASS FILTERS WITH CENTER FREQUENCIES IN THE RANGE OF 10-60 MC, by Leo Storch. Quarterly progress rept. no. 2, 1 Jan-31 Mar 57, on High Frequency Crystal Filters, Contract DA 36-039-sc-73070. [1957] 37p. 9 refs. Rept. no. 73070-2-Q.
Order from LC mi$3.00, ph$6.30 PB 146 564

A powerful crystal filter design procedure, which has been designated as the "Type NB technique", is outlined. Prototype designs based on this method for the following filters are described. (1) Center frequency: 11.5 mc; 6 db bandwidth: 40 kc; optimized bandpass characteristics for a total of 7 crystals. (2) Same center frequency and bandwidth as in #1, but characteristics optimized for a total of 5 crystals. (3) Center frequency: 20 mc; 3 db bandwidth: 150 kc; a total of 7 crystals. (4) Center frequency: 24 mc; 6 db bandwidth: 400 kc; a total of 8 crystals. Recent developments in linearized-phase crystal filter design are described. A prototype design of a Gaussian response filter with a 3 db bandwidth of 800 kc with respect to a center frequency of 10 mc and employing LC resonators is discussed.

Hughes Aircraft Co., Culver City, Calif.
DEVELOPMENT OF NARROW-BAND BANDPASS FILTERS WITH CENTER FREQUENCIES IN THE RANGE OF 10 - 60 mc, by Leo Storch. Quarterly progress rept. no. 4, 1 May-15 Sep 58, on High Frequency Crystal Filters, Contract DA 36-039-sc-73070. [1958] 26p. 2 refs. Rept. no. 73070-4-Q.
Order from LC mi$2.70, ph$4.80 PB 146 676

The design, construction and test results for two different high-frequency quartz crystal filters are discussed. The first of these filters possesses a center frequency of 11.5 mc, a 6 db bandwidth of 55 kc, and a sharp selectivity characteristic. The second filter is a branching filter with the center frequencies of the two constituent filters lying in the vicinity of 37 mc and the 6 db bandwidths of the individual filters equal to 3 kc. (Author)

International Resistance Co., Philadelphia, Pa.
HIGH TEMPERATURE, GENERAL PURPOSE, FIXED RESISTORS, by William F. Ebling, Jr., and Henry D. Pugh. Rept. on Improved Electronic Components, Contract AF 33(616)3633. Feb 60, 57p. WADD Technical rept. 60-131.
Order from OTS $1.50 PB 161 688

Fifty, 1500, 0.25M, and 2M-ohm resistors have been fabricated using "Carbon Alloy" resistance films deposited on high alumina substrates protected by a reducing atmosphere. Special hard soldering and leak testing procedures are discussed. Performance data is included for resistance-temperature characteristics between 25° and 500°C, load life testing for 1000 hours at 1-watt load, temperature cycling between -77° and 500°C, vibration testing from 10-3000 cycles per second at 15G, and terminal strength appraisal of 5 pounds up to and including 500°C. In 0.25M-ohm and 2M-ohm resistors and blank units, a paralleling conductivity was observed as low as 50K-ohm after 100 hours operation at 500°C. No substantiated explanation of the paralleling conductivity is presented. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington.
TRANSISTOR LIFE EXPERIENCE: 1954-1958, by D. J. Eckl, P. A. Fergus, and R. L. Burke. Rept. on Contract AF 19(604)5200. 26 Mar 59, 40p. 7 refs. Technical rept. no. 199; AD-214 565.
Order from OTS $1.00 PB 161 675

Original small-scale life tests, started in 1954 on the surface-barrier transistor, produced 4 million operating transistor hours with 5 transistor failures. In 1955 further data were obtained from two prototype systems: TM-1, an 8-digit multiplier, and EMAR, an experimental memory-address register. The TX-0 computer started operation in April 1956 and in April 1958 it had been in operation for 6000 hours. At this time 660 transistors were retested. All are still operating in TX-0 because of anticipation of and allowance for some parameter degradation. The most serious change has been a decrease in current gain. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
SPIN ECHO RESONANCE, by Daniel E, Kaplan and Michael E. Browne. Annual status rept. no. 1 on Contract Nonr-2541(00). 1 Apr 59, 11p. LMSD-48497.
Order from LC mi$2.40, ph$3.30 PB 145 735

Development of a millimicrosecond resolution time, electron pulse spectrometer has been undertaken with the dual objectives of investigating the feasibility of information storage in electron paramagnetic systems by spin echo techniques and of providing a research tool that would be useful for studying fast relaxation phenomena in such systems.

Mallory, P. R., and Co., Inc., Indianapolis, Ind.
SWITCH, ROTARY, 3-POLE, 8-POSITION HERMETICALLY SEALED, by Lowell G. Brodrick, Donald E. Givan and others. Rept. for 27 Jan 55-20 July 59 on Improved Electronic Components, Contract AF 33(600)29252. Jan 60, 122p. 135 refs. WADC Technical rept. 59-623.
Order from OTS $2.75 PB 161 659

This report covers the research leading to the development of two entirely different types of three pole, eight position, hermetically sealed, rotary switches. Included in this report are factual data pertaining to the design and development program, the technical requirements followed, and a detailed test report for the final developmental models. The switches submitted to the Air Force for approval were designed to make and break resistive loads at 300 volts DC, 50 millamperes, with superimposed radio frequencies up to 30 megacycles at 0.1 volt rms. The switch housing employed a one-piece metal case with three rows of eight each glass-insulated, eyelet-type terminals soldered around the periphery of the case. Switching was obtained by appropriate double leaved contacts engaging rotor shoe tabs as the rotors were rotated. The switches were approximately 1.6 inches in diameter and 1.5 inches long (exclusive of terminal and shaft extensions). This represented a volume of 3.1 cubic inches and a weight of 3.1 ounces. (Author)

Maxson, W. L., Corp., New York.
REDESIGN OF AMPLIFIER-POWER SUPPLY AM-598 (XM-1)/U, by R. Gittleman and S. Stempler. Final engineering rept. for 26 Mar 56-18 July 58 on Contract DA 36-039-sc-71222. Corrected to 31 Aug 59, 86p. Rept. no. 3074-1; AD-226 383.
Order from LC mi$4.80, ph$13.80 PB 145 956

The program is described that led to the redesign of amplifier-power supply AM-598/U. The equipment, designated amplifier-power supply AM-598(XM-1)/U, is a completely transistorized device, utilizing printed circuitry and a plug-in design to enhance reliability, servicing, and maintenance. The equipment converts the varying prime voltage of the vehicle to the regulated voltages to operate radio receiver transmitter type RT-176. An audio amplifier to operate loudspeakers in conjunction with the radio receiver is included. (Author)

Michigan U. Research Inst., Ann Arbor.
INVESTIGATION OF MICROWAVE PROPERTIES OF FERROELECTRIC MATERIALS, by C. B. Sharpe and C. G. Brockus. Final rept. for 1 Feb 58-31 Jan 59 on Contract DA 36-039-sc-75003. Mar 59, 67p. 13 refs. 2732-4-F.
Order from LC mi$3.90, ph$10.80 PB 145 893

A method is developed for measuring the complex dielectric-constant $\varepsilon' - j\varepsilon''$ of ferroelectric materials in the frequency range 1.8-4.0 kmc. Data are given on the variation of ε' and ε'' with frequency, temperature, and bias field for a number of ferroelectric ceramics. (Author) (See also PB 138 790)

Microwave Associates, Inc., Burlington, Mass.
HIGH REPETITION RATE BROADBAND DUPLEXER, by L. Gould and E. Horn. Quarterly progress rept. no. 3, 15 Feb-15 May 59, on Contract DA 36-039-sc-78165. 4 Apr 58, 44p. AD-226 815.
Order from LC mi$3.30, ph$7.80 PB 146 494

Measurements of arc loss and recovery time as a function of gas pressure were obtained for argon, neon, krypton and xenon using an encapsulated window containing medium density quartz wool. In addition, measurements of recovery time as a function of gas processing indicate that impurities may be present which increase the arc loss. Measurements of arc loss and recovery time as a function of peak incident power were obtained for argon at various gas pressures. A study of echo signal attenuation as a function of time indicates that the rate of attenuation is a function of the nature of the gas and the gas pressure. The TR filter design investigation shows that a bandpass of 2400 to 2800 Mc with a VSWR less than 1.3 can be obtained for a single tube incorporating an encapsulated input window. (Author)

Microwave Associates, Inc., Burlington, Mass.
INVESTIGATION OF DUPLEXING TECHNIQUES AT HIGH DUTY CYCLE CONDITIONS, by Lawrence Gould. Quarterly progress rept. no. 1, 1 Oct-31 Dec 58, on Contract DA 36-039-sc-78233. [1958] 32p. AD-217 834.
Order from LC mi$3.00, ph$6.30 PB 145 958

A study program for a theoretical and experimental study and investigation of techniques leading to the development of microwave duplexers for operation at high duty cycle conditions has been initiated. Gas discharge switching devices are discussed and the recovery time and arc loss values are presented for a number of gases. Preliminary results on ferrite circulators are discussed. Insertion loss values of less than 0.4 db were obtained. Some results on crystal protector TR tube at high repetition rate are presented. Recovery times less than 0.1 μs can be achieved for both gas switching elements and crystal protector TR tubes. (Author)

Microwave Associates, Inc., Burlington, Mass.
INVESTIGATION OF DUPLEXING TECHNIQUES AT HIGH DUTY CYCLE CONDITIONS, by Lawrence Gould. Quarterly progress rept. no. 2, 1 Jan-31 Mar 59, on Contract DA 36-039-sc-78233. [1959] 26p. AD-226 012.
Order from LC mi$2.70, ph$4.80 PB 145 959

An analysis of the power handling limitations of

ferrite circulators at low values of peak power and high repetition rates is discussed. The results indicate that the thermal conductivity, insertion loss, and height of the ferrite material are important parameters. Techniques for enhancing the power handling capability of crystal protector TR tubes is discussed. In particular, a balanced ATR switch shows promise for this application. Preliminary studies on limiting with ferrites showed values of threshold power of the order of 100 peak power. (Author) (See also PB 145 958)

Microwave Associates, Inc., Burlington, Mass.
INVESTIGATION OF DUPLEXING TECHNIQUES AT HIGH DUTY CYCLE CONDITIONS, by Lawrence Gould. Quarterly progress rept. no. 3, 1 Apr-30 June 59, on Contract DA 36-039-sc-78233. [1959] 17p. AD-228 147.
Order from LC mi$2.40, ph$3.30 PB 146 495

The feasibility of Tee circulators as high duty cycle duplexers in considered. Experimental models indicate that for bandwidths of the order of 3 to 4% isolations higher than 20 db and insertion losses less than 0.3 db can be achieved. The circulators were evaluated as high as 70 w average power at extremely high repetition rates with no deterioration in performance. Measurements on the characteristics of crystal protector TR tubes were continued. Results on recovery time and leakage power are reported. Of significance is the discontinuity in recovery time and leakage power at the peak power corresponding to input window breakdown. (Author) (See also PB 145 959)

Microwave Associates, Inc., Burlington, Mass.
RESEARCH AND DEVELOPMENT PROGRAM ON A MINIATURE X-BAND PULSED MAGNETRON (MA208) by A. C. Bougas. Final progress rept. for 1 Oct 57-31 Dec 58 on Contract DA 36-039-sc-74919. [1959] 56p. AD-220 530.
Order from LC mi$3.60, ph$9.30 PB 146 015

A description is presented of the final electrical and mechanical design characteristics for the MA208 magnetron. A photograph, outline drawing, and cross-section view of the final magnetron are included. A summary of the major technical and operational problems encountered is given. The methods of approach used to solve the problems are related. The general problem areas are divided and described according to the major sub-assemblies involved.

Microwave Engineering Labs., Inc., Palo Alto, Calif.
INVESTIGATION OF MICROWAVE NON-LINEAR EFFECTS UTILIZING FERROMAGNETIC MATERIALS, by Roy W. Roberts. Quarterly progress rept. no. 8, 1 Feb-30 Apr 59, on Contract DA 36-039-sc-73278. [1959] 22p. 5 refs. AD-220 227.
Order from LC mi$2.70, ph$4.80 PB 146 492

Thin slabs of ferrite magnetized in the plane of the slab have been tried for harmonic generation. In general, the slab geometry has not given as large outputs as other configurations which have been investigated more extensively. (See also PB 142 766)

Microwave Engineering Labs., Inc., Palo Alto, Calif.
INVESTIGATION OF MICROWAVE NON-LINEAR EFFECTS UTILIZING FERROMAGNETIC MATERIALS, by Roy W. Roberts. Quarterly progress rept. no. 9, 1 May-31 July 59, on Contract DA 36-039-sc-73278. [1959] 32p. 2 refs. AD-229 053.
Order from LC mi$3.00, ph$6.30 PB 146 491

Efficient doubling was obtained with a single crystal yttrium iron garnet sphere. A sphere grinder and resonance linewidth test fixture were built for checking the quality of the single crystal garnets grown under this program. (See also PB 146 492)

Microwave Associates, Inc., Burlington, Mass.
VARIABLE CAPACITANCE MICROWAVE DIODE. Quarterly progress rept. no. 2, 1 Feb-30 Apr 59 on Contract DA 36-039-sc-78236. [1959] 52p. 4 refs. AD-225 433.
Order from LC mi$3.60, ph$9.30 PB 145 960

A technique is discussed for measuring varactor cutoff frequency at X-band. The cutoff-frequency values are conservative and may be treated as lower limits, because cartridge and holder losses are included. The main features of the techniques are: use of high frequency, exploitation of the variable capacitance property as an essential part of the measurement, and use of low-loss tuning elements to improve accuracy and simplify calculations. It is argued that this technique is the most reliable thus far described. Test results are given on a fairly large number of sample model varactors. The cutoff frequency, measured at X-band, varies from 50 to 80 kMc for units with zero-bias capacitance less than 2 uuf, down to 30 kMc for units with zero-bias capacitance of 5 uuf. (Author)

Microwave Lab., Stanford U., Calif.
AN IMPROVED PULSE TRANSFORMER FOR HIGH-VOLTAGE APPLICATIONS, by T. F. Turner. Technical rept. on Contract Nonr-225(48). May 59, 16p. 2 refs. M. L. no. 609.
Order from LC mi$2.40, ph$3.30 PB 146 225

Economy often dictates the use of a very low impedance network and step-up ratios of as much as 20 or 30. Transformers for such service are expensive to construct, and they deteriorate the pulse shape. In addition, the additional energy dissipated during the long rise and decay times required to obtain high step-up ratio and a reasonably flat top portion of the pulse requires a large investment in line storage capacitors and, of course, increases the operating cost. The transformer design described below substantially reduces the leakage inductance and at the same time reduces the total size and amount of core material required for a given high-voltage transformer.

Microwave Lab., Stanford U., Calif.
MICROWAVE TUBE RESEARCH, by E. L. Ginzton and M. Chodorow. Quarterly status rept. no. 33, 1 Apr-30 June 58, on Contract N6onr-251(23). July 58, 34p. 3 refs. M. L. rept. no. 535; AD-211 183.
Order from LC mi$3.00, ph$6.30 PB 146 696

Contents:
Structures for high-power traveling wave tubes
Distributed-interaction klystrons
Field-emission harmonic generation
Space-charge effects in velocity-modulated beams
Fast-wave tubes
Large-signal klystron theory
High-power klystron studies

Microwave Lab., Stanford U., Calif.
PARAMETRIC REFRIGERATION: A MECHANISM FOR REMOVAL OF NOISE FROM THE SLOW WAVE OF AN ELECTRON BEAM, by P. A. Sturrock. Scientific rept. no. 16 on Contract AF 19(604)1930. Oct 59, 22p. 15 refs. M. L. Rept no. 656; AFCRC-TN-59-974. AD-231 894.
Order from LC mi$2.70, ph$4.80 PB 145 766

Reasons for believing it to be impossible to remove the noise power from the slow wave of an electron beam are reviewed and found not to be cogent. A method for effecting this removal is proposed. Noise is first removed, by conventional techniques, from a band of fast waves; an appropriate parametric coupling, by means of an applied pump wave, between this band of fast waves and a band of slow waves then leads to a spatially periodic exchange of excitations between these waves so that one may transfer the noise which will be present on the slow waves to the fast waves. There are no obvious modes of instability in this process. By an appropriate choice of frequencies, the slow wave may be cooled to a temperature below the initial temperature of the fast wave: this device therefore constitutes a "parameter refrigerator". (Author)

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
HIGH POWER MICROWAVE SWITCH, by S. J. Tetenbaum. Quarterly progress rept. no. 3, 16 Dec 58-15 Mar 59, on Contract DA 36-039-sc-78044. 13 Apr 59, 38p.
Order from LC mi$3.00, ph$6.30 PB 145 809

High power measurements were performed on a helium-filled encapsulated window switch. Two forsterite tubes have been successfully constructed. The pyroceram cement sealing technique works excellently. A number of techniques were investigated for employing synthetic mica, a readily machinable material, in tube construction. Satisfactory final designs for the electromagnet and switching power supply have been achieved, and both are being constructed. (See also PB 142 762)

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
INVESTIGATION OF THE USE OF ELECTRON CYCLOTRON RESONANCE TO OBTAIN MICROWAVE PHASE SHIFT, by H. Bandel, A. Penico and F. Olson. Scientific rept. no. 1 on Contract AF 19(604)2231. 2 Apr 58, 46p. 3 refs. Technical rept. MPL-11; AFCRC-TN-58-158; AD-152 391.
Order from LC mi$3.30, ph$7.80 PB 137 912

The feasibility of applying the dispersive properties of gas discharges near cyclotron resonance as the basis for developing electronically controllable microwave phase shifters has been investigated. Preliminary results indicate that it is possible to achieve a high figure of merit (phase shift per unit loss) over an appreciable range of phase shift by either magnetic field control or by electron density control.

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
MIXING IN FERRITES AT MICROWAVE FREQUENCIES, by P. H. Vartanian and E. N. Skomal. Rept. on Contract DA 36-039-sc-73188. 7 May 57, 11p. 3 refs. Technical rept. MPL-5; AD-129 869.
Order from LC mi$2.40, ph$3.30 PB 145 880

Microwave mixing in ferrites is experimentally observed by subjecting a magnetized ferrite to two X band signals of differing frequency. Both sum and difference components are generated. A conversion efficiency for the sum frequency of -13 db was observed with a local oscillator power of 13 kw. The sum frequency output is observed to be linear with both signal and local oscillator inputs even when the two signals are of equal level. (Author)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
SYNTHESIS OF INFINITE ZERO-POLE NETWORK STRUCTURES, by S. Deutsch. Rept. on Contract Nonr-839(05). 19 May 59, 35p. 11 refs. Research rept. R-739-59; PIB-667.
Order from LC mi$3.00, ph$6.30 PB 145 993

A desired amplitude or phase response that contains a "sharp corner" or slope discontinuity can be represented by an infinite number of zeros and/or poles in the s-plane. An approximation to the desired response can be achieved by rounding off the sharp corner and synthesizing the corresponding network structure. A different approach is suggested in this paper: (1) An exact analytic expression is given for the desired response; (2) the corresponding network is synthesized with the aid of infinite ladder structures. Synthesis of a ladder is carried out to a reasonable number of elements. An increased number of elements. An increased number of elements yields a better approximation to the desired response.

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
MICROWAVE CRYSTAL DETERIORATION STUDIES, by P. P. Lombardini and R. J. Doviak. Quarterly progress rept. no. 3, 1 Feb-30 Apr 59, on Contract DA 36-039-sc-78055. 31 May 59, 39p. 8 refs. Moore School rept. no. 59-18; AD-225 424.
Order from LC mi$3.00, ph$6.30 PB 145 808

Recent investigations have shown that the whisker contact pressure must be standardized before any comparable measurements of temporary deterioration are made. The effect exists in both types of silicon. Tests performed on germanium p-n junction diodes at room temperature and at -180°C have shown no temporary deterioration effects.

MSA Research Corp., Callery, Pa.
STUDY OF ENERGY CONVERSION DEVICES, by R. E. Shearer. Quarterly progress rept. no. 1, 1 July-30 Sep 59, on Contract DA 36-039-sc-78955. 31 Oct 59, 31p. 11 refs. MSAR 59-119; AD-230 503.
Order from OTS $1.00 PB 161 690

Preliminary investigations were made into the development of energy conversion device converting thermal energy into electrical energy by means of thermal decomposition of ionic hydrides followed by electrochemical recombination of the decomposition products on a cyclic and continuous basis. A closed cycle system was constructed on information obtained in earlier batch-type cells. It was based on lithium hydride in the molten eutectic of the chloride and fluoride of lithium. Only 270 mv was obtained with one atmosphere of hydrogen pressure prior to regenerative operation and a peak of only 30 mv was obtained regeneratively. These values are susceptible to improvement by improved cell design and higher temperature operation of the regenerator, which was held to the range of 1300 to 1400 F because of limitations imposed by materials of construction. Construction of an improved regenerative system was undertaken on the basis of information developed with the first system. Differential thermal analysis on temperature changes of the eutectic of the ternary salt system LiI-LiCl-LiF shows a eutectic temperature in the range of 395 to 420°C compared with 485°C for the binary eutectic of LiCl-LiF. In one test on a batch-type cell with a potassium anode and the eutectic of KCl-LiCl as solvent, an open circuit voltage of 0.33 was obtained with the cell at 710°C. The information developed above gives background for improved regenerative operation with lower melting solvents, different anode material or higher temperature operation. (Author)

National Bureau of Standards, Boulder, Colo.
OPERATING INSTRUCTIONS FOR ARN-2 AUXILIARY LOG-LINEAR NOISE RECORDER, by R. T. Disney and C. A. Samson. Jan 60, 34p. 3 refs. Technical note no. 45.
Order from OTS $0.50 PB 151 404

National Co., Inc., Malden, Mass.
DEVELOPMENT OF FSK-4 RECEIVER SYSTEMS. Final rept. for 25 Mar 58-15 Jan 60 on Contract AF 19(604)3070. 15 Jan 60, 188p. AFCRC-TR-60-102.
Order from LC mi$8.40, ph$28.80 PB 145 759

This final report describes a long-range, FSK radio teletype system. The principles of system operation are given, along with the theoretical aspects involved in the implementation of the design for optimum performance. Further development possibilities for future investigation are outlined. The appendixes contain extensive reference data on the equipment and complete alignment procedures for the individual units. (Author)

Naval Ordnance Test Station, China Lake, Calif.
CHARACTERISTICS OF AN ULTRAVIOLET-SENSITIVE PHOTOMULTIPLIER, by R. G. McCarty and J. Weimholt. 31 Dec 59, 13p. 2 refs. NOTS TP 2383. AD-232 533.
Order from LC mi$2.40, ph$3.30 PB 145 907

The characteristics of several types of ultraviolet-spectrum-sensitive photomultiplier tubes have been measured. One tube, is considered exemplary. Its characteristics are indicative of performance to be expected, or at least desired, in forthcoming ultraviolet-sensitive photomultiplier tubes. Characteristics, including gain, sensitivity, and stability are reported. Apparatus, including power source, used in evaluating this optical, light-detector device, are itemized.

Naval Research Lab., Washington, D. C.
THERMOELECTRICITY ABSTRACTS. March 60, 120p. 533 refs.
Order from OTS $2.50 PB 161 301

This, the third bibliography in a series, includes current periodicals and research reports received in the Library of the U. S. Naval Research Laboratory and the following index and abstract journals: Applied mechanics reviews; Applied science and technology; ASM review of metal literature; Battelle Technical review; Bell telephone laboratories. Technical information libraries. Index to current technical literaure; Chemical abstracts; Engineering index; Institute of radio Engineers. Proceedings; Metallurgical abstracts Monthly index of Russian accessions (Library of Congress) Nuclear science abstracts; Readers guide to periodical literature; Science abstracts (Section A. Physics abstracts; Section B. Electrical engineering abstracts) Semiconductor electronics; Technical abstract bulletin (ASTIA) U. S. Government research reports (OTS). (See also PB 151 810)

Office of Scientific Research and Development. Div. 7.
RANGE FINDERS AND TRACKING. Summary technical rept. vol. 2, Contract OEMsr-1131. 1947, declassified 23 Apr 58, 208p. 623 refs.
Order from LC mi$9.30, ph$31.80 PB 139 788

Office of Scientific Research and Development, Div. 14.
MILITARY AIRBORNE RADAR SYSTEMS [MARS]. Summary technical rept. vol. 2, Contract OEMsr-1131. 1946, declassified 23 Apr 58, 338p. 329 refs.
Order from LC mi$11.10, ph$51.60 PB 139 786

Office of Scientific Research and Development. Div. 14.
RADAR: SUMMARY REPORT AND HARP PROJECT. Summary technical rept. vol. 1, Contract OEMsr-1131. 1946, declassified 23 Apr 58, 176p. 40 refs.
Order from LC mi$8.10, ph$27.30 PB 139 791

Pan-Electronics Corp., Griffin, Ga.
INDUSTRIAL PREPAREDNESS STUDY, QUARTZ CRYSTAL UNITS CR-(XM-3)U, by John R. Blasingame. Final rept. on Step 1, Contract DA 36-039-sc-72689. Dec 58, 62p. AD-213 930.

Order from LC mi$3.90, ph$10.80 PB 145 882

A process is described for the manufacture of quartz crystals operating on the fundamental mode at frequencies of 4.3, 6.2, 9.0, 15.5 and 20.0 megacycles. Problems of especial importance were: (1) Cutting quartz bars to close tolerances. (2) X-ray measurements and equipment. (3) Lapping quartz blanks. (4) Radio lapping. (5) Contour of blanks below 10 MC. (6) Materials and methods for base plating. (7) Sealing can to base. (8) Short-term aging.

Penta Labs., Inc., Santa Barbara, Calif.
EVALUATION OF TRANSMITTING BEAM PENTODE TYPE PL-177A, by R. L. Norton. Final rept. for 1 Dec 57-31 Dec 58 on Contract DA 36-039-sc-74978. [1959] 53p. AD-219 217.
Order from LCmi$3.60, ph$9.30 PB 146 014

Fifty-two type PL-177A 75-watt transmitting pentodes were tested to determine the normal range of electrical characteristics for this type. Ten tubes from this group were tested to determine mechanical characteristics. Twenty-one tubes from the group were subjected to 1000-hour life test at VHF. The results of the the tests are presented in tabular, graphical and histogram form. A proposed MIL-E-1 type specification for the PL-177A is given. (Author)

Philco Corp., Philadelphia, Pa.
RESEARCH AND EXPERIMENTAL WORK ON MICROWAVE TRANSISTORS, by W. C. Follmer, M. M. Fortini and others. Quarterly progress rept. no. 5, 15 Jan-15 Apr 59, on Contract DA 36-039-sc-74988. [1959] 27p. 51 refs. Philco no. H-2153-5; AD-225 036.
Order from LC mi$2.70, ph$4.80 PB 145 877

Transistor action in depletion-layer devices was achieved when the bias on the injecting probe is more positive than the floating potential is negative. The fabrication work was concerned principally with the development of techniques for forming contacts to high-resistivity p-type silicon. Best results were obtained with a pressure-bonding technique that uses titanium-aluminum foil as the tab material. Fabrication and testing of germanium depletion-layer devices has continued.

Physical Research Lab., Space Technology Labs., Inc., Los Angeles, Calif.
A RESONANT CAVITY WITH A UNIFORM FIELD SECTION, by Erich S. Weibel. Rept. on Contract AF 04(647)127. 19 Mar 58, 19p. GM-TR-0127-00017.
Order from LC mi$2.40, ph$3.30 PB 146 851

Pickard and Burns, Inc., Needham, Mass.
ANTENNA SYSTEM FOR AIRBORNE X-BAND BEACON, DEVELOPMENTAL MODEL, by Thomas C. Cahill. Final technical rept. for 14 Apr 58-30 June 59 on Contract DA 36-039-sc-75018. 30 June 59, 47p. 1 ref. P&B Pub. no. 541; AD-225 118.
Order from LC mi$3.30, ph$7.80 PB 145 957

Report covers design and development of an antenna system for an airborne X-band beacon to be used on the RP-71 drone or equivalent aircraft. A study of radiation patterns of antennas mounted on various parts of the drone showed that a single antenna was inadequate. Tests with two identical, equally powered, antennas proved satisfactory. Transmission line problems were solved by the use of Phelps-Dodge Foamflex cable with modified connectors for the upper antenna and RG9B/U cable for the lower. The system is made up of two discone radiators, two Teflon radomes, a power divider, and upper and lower transmission lines. The system, its relative position in the drone, and the three major planes of the aircraft are illustrated. A series of radiation patterns, recorded through the planes (yaw, roll, and four angles of pitch) at frequencies of 8500, 9100, and 9600 megacycles, show that the system omnidirectionally covers the frequency range required within the limits of the specifications. Other graphs show that the system and its components meet the limit for VSWR characteristics. (Author)

Psychological Lab., Johns Hopkins U. [Baltimore, Md.]
SIGNAL MARK SIZE AND VISIBILITY OF RADAR SIGNALS ON A PLAN POSITION INDICATOR, by N. R. Bartlett and S. B. Williams. Rept. on Systems Research, Contract N5ori-166(01). 20 Sep 47, 18p. 3 refs. Rept. no. 166-I-30.
Order from LC mi$2.40, ph$3.30 PB 137 809

Preliminary research on the detectability of signal images on a 7BP7 radar screen indicates the extreme importance of the image size. Image size was varied (1) by regarding the radar screen from different distances, (2) by changing the length of the image by widening the azimuth gate, (3) by changing the thickness of the image by switching to different presentation range scales and (4) by moving the signal from the center to the periphery of the screen. Image size variations by such methods can change the strength of the minimum visible signal by at least eight or ten decibels. The data are preliminary, for equipment limitations did not permit variations from a signal pulse length of two microseconds nor reductions in azimuth gate below 12 degrees. Further research on the problem of image size with refined equipment is now in progress. (Author)

Radio Corp. of America, Lancaster, Pa.
ELECTRON TUBE MATERIALS, GASES, AND GETTERS, by J. C. Turnbull and G. P. Kirkpatrick. Quarterly progress rept. no. 2, 15 Jan-15 Apr 59, on Contract DA 36-039-sc-78226. 15 May 59, 163p. 134 refs. AD-220 824.
Order from LC mi$7.80, ph$25.80 PB 145 805

Surveys on the state of the art on outgassing techniques and on getter techniques and materials used in making electron tubes are included. Measurements are given of the thermal outgassing of nickel, cold rolled low carbon steel and nickel plated steel, on heating these materials to 1000°C. Results are summarized as follows: (a) For all materials, carbon monoxide is the predominant gas evolved with smaller quantities of carbon dioxide, nitrogen and hydrogen;

(b) Nickel shows lower gas levels than steel, while nickel plated steel resembles nickel more than steel in high temperature outgassing performance; (c) Vacuum melted nickel shows the same gas levels as air melted nickel, for the particular lots tested; and, (d) Comparing thicker (0.020") versus thinner (0.005") strip from the same vacuum melted nickel ingot, the thicker material shows, per unit area of sample, the same or lower gas levels. (Author) (See also PB 145 237)

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
ALGEBRAIC DECODING FOR A BINARY ERASURE CHANNEL, by M. A. Epstein. Doctoral thesis. Rept. on Contract DA 36-039-sc-64637. 14 Mar 58, 15p. 10 refs. Technical rept. 340; AD-208 649.
Order from LC mi$2.40, ph$3.30 PB 145 780

This paper presents an optimum decoding procedure for parity check codes that have been transmitted through a binary erasure channel. The erased digits are decoded by means of modulo 2 equations generated by the received message and the original parity check equations. Most previous decoding procedures required a number of computations that grew exponentially with code length. At best, the required number of computations grew as a polynomial of code length. The decoding procedure for convolution parity check codes presented here will decode with an average number of computations per digit that is bounded by a finite number, which is independent of code length, for any rate less than capacity. (Author)

ResearchLab. of Electronics, Mass. Inst. of Tech., Cambridge.
ANALYSIS OF CIRCUITS WITH MULTIPLE-HOLE MAGNETIC CORES, by Lubomyr S. Onyshkevych. Master's thesis. Rept. on Contract DA 36-039-sc-64637. 9 July 57, 67p. 47 refs. Technical rept. 329; AD-214 554.
Order from LC mi$3.90, ph$10.80 PB 145 779

Multiple-hole magnetic cores, also called transfluxors, which have been developed recently, promise to be very useful in computer, control, and other logical circuitry. They are ferrite cores, with square hysteresis loops, of various complicated geometries. In this report, a workable analysis procedure for circuits that contain transfluxors is developed; it is based on the square-waveshape approximation. This analysis forms a basis for a design procedure. Sample circuits were designed and tested, and the results were found to be within 10 per cent of the predicted values. The main problems in circuit design were flux division and loading effects. Diode elimination presented another problem, which is treated at some length in this report. Diodeless operation of a transfluxor circuit was found to be possible, but slow, unreliable, and critical. In the field of logical design, a symbolic notation was developed, and an approach to design was made, using "gate boxes." A description of the physical properties of transfluxors is given; it includes some new, unpublished, special effects encountered with multiple-hole cores. (Author)

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
THEORY OF THE ANALYSIS OF NONLINEAR SYSTEMS, by Martin B. Brilliant. Doctoral thesis. Rept. on Contract DA 36-039-sc-78101. 3 Mar 58, 60p. 15 refs. Technical rept. 345; AD-216 209.
Order from LC mi$3.60, ph$9.30 PB 146 001

A theory of the analysis of nonlinear systems is developed. The central problem is the mathematical representation of the dependence of the value of the output of such systems on the present and past of the input. It is shown that these systems can be considered as generalized functions, and that many mathematical methods used for the representation of functions, of a real variable, particularly tables of values, polynomials, and expansions in series of orthogonal functions, can be used in generalized form for nonlinear systems.

Rome Air Development Center, Griffiss AFB, N. Y.
DESIGN OF A QUASI-DOPPLER UHF DIRECTION FINDER (RADIO DIRECTION FINDER AN/GRD-11), by Richard C. Benoit, Jr., Francis Coughlin, Jr. and Stanley Kraszewaski. Nov 59, 31p. RADC-TR-59-106.
Order from LC mi$3.00, ph$6.30 PB 145 851

This report describes the design of Radio Direction Finder AN/GRD-11, a medium-aperture, quasi-Doppler direction finder operating in the frequency range of 225 to 399.9 mc. Contemporary techniques are compared to the quasi-Doppler technique, with respect to accuracy, reliability, susceptibility to site errors, and over-all system performance. The equipment developed is described and compared to existing direction finders. It is shown that the AN/GRD-11 provides a stable, fast-response bearing which is more reliable and more accurate than that obtained with contemporary, narrow-aperture, uhf D-F equipments.

Rome Air Development Center, Griffiss AFB, N. Y.
EVALUATION OF THE "M" TYPE CARCINOTRON FOR COMMUNICATIONS, by Ralph W. Mifflin and Joseph W. Ferguson. Feb 60, 16p. 1 ref. RADC-TN-60-30.
Order from LC mi$2.40, ph$3.30 PB 146 430

An "M" type carcinotron, backward wave power oscillator type CM 252, was delivered to RADC for evaluation for communication purposes. This tube is evaluated and problems in frequency stabilization are described. The use of this tube for quantized frequency modulation systems is indicated. Tests performed and their results are discussed. (Author)

Skiatron Electronics and Television Corp., New York.
VIDEO CONVERTER GROUP OA-1021(XW-1)/GPA-29. Final development rept. for Feb-Sep 56 on Contract AF 30(602)1460. [1956] 21p. RADC-TR-57-119; AD-131 170.
Order from LC mi$2.70, ph$4.80 PB 146 155

The adequate generation of locally generated, as well

as radar derived information is an important consideration in air traffic control and aircraft warning systems. The information presented in this report will cover the development of a device (to be used with the GPA-29 radar transmission system) which can be used to generate and insert into the radar video, information of various types. This information can take the form of map overlays, identifying numbers, symbols, or other information, and can be inserted with a simple marker or grease pencil. (Author)

Sonotone Corp., Elmsford, N. Y.
STUDY OF SEALED NICKEL-CADMIUM BATTERIES, by Irwin M. Schulman and Paul Ritterman. Quarterly rept. no. 2, 1 Mar-31 Mar 59, on Research investigations to develop and evaluate a nickel cadmium battery having a hermetically sealed construction, and to study its reaction mechanisms. Contract DA 36-039-sc-78249. [1959] 53p. 8 refs. AD-225 160.
Order from LC mi$3.60, ph$9.30 PB 145 802

Forty-eight cells with varying concentrations and amounts of electrolyte were started on a life cycling program. The capacity data is reported. A new experiment was designed to test the effects of cobalt addition to the positive plates, lithia addition to the electrolyte, and varying negative/positive capacity ratios. There are general indications that the rate of recombination of oxygen with the negative plate is a function of the mole fraction rather than the partial pressure of oxygen when using a mixture of nitrogen and oxygen.

South Carolina U., Columbia.
APPLICATIONS OF A DIELECTRIC SHEET HALF-REFLECTING MIRROR AT MILLIMETER WAVELENGTHS, by R. G. Fellers. Rept. on Contract AF 18(603)43. 2 Jan 60, 21p. 3 refs. AFOSR-TN-60-14.
Order from LC mi$2.70, ph$4.80 PB 145 789

A free-space transmission system has been investigated as a possible low-loss replacement for waveguide over within system distances. In the use of such a scheme, it is necessary to devise the free-space equivalent of a number of waveguide components including the magic-tee, the wavemeter, the standing wave indicator and the duplexer. A dielectric sheet of appropriate thickness can be made to act as a half-silvered mirror and hence to serve the purpose of a magic-tee or three decibel directional coupler. Using this unit, a duplexer can be constructed and a Michelson interferometer can be built which will perform the functions of a wavemeter and a standing wave indicator.

Stanford Research Inst., Menlo Park, Calif.
BEACON ANTENNAS FOR DRONE AIRCRAFT USED AT WHITE SANDS MISSILE RANGE, by John B. Chown and Harold S. Rothman. Final rept., Task III, on Contract DA 36-039-sc-71205. Feb 59, 41p. 5 refs. AD-225 013.
Order from LC mi$3.30, ph$4.80 PB 145 942

An investigation was made of the general nature of problems associated with low-angle tracking of beacon-equipped aircraft and drones at WSMR. The investigation was made in two main parts. First, low-angle tracking was studied to determine the important limitations of the presently available tracking equipment and to ascertain where significant improvement in system performance can be made. Second, the airborne antenna was considered, to determine the proper location of the antennas on the aircraft to obtain the desired radiation patterns. Sufficient data are provided to select satisfactory antenna locations without the necessity of making extensive radiation pattern studies. (Author)

Stanford Research Inst., Menlo Park, Calif.
AN EXAMINATION OF BACKSCATTER PROPAGATION BETWEEN BOZEMAN, MONTANA AND PALO ALTO, CALIFORNIA, by Russell T. Wolfram. Scientific rept. 1 on Contract AF 19(604)5571. Jan 60, 23p. 4 refs. AFCRC-TN-60-120; AD-232 605.
Order from LC mi$2.70, ph$4.80 PB 146 013

Non-great-circle, ground backscatter, radio propagation paths between Bozeman, Montana, and Palo Alto, California, were studied by means of a radio scanning and direction-finding system operating at 33 Mc. The system utilized a 1.5-kw, FM transmitter at Bozeman and receiving and recording equipment at Palo Alto. Rotating directional antennas were used at both stations to determine the bearings of paths over which signals were propagated. During the observing period great-circle propagation along the 1200 km path was negligible, but strong signals were received over two 5000-km, two-hop paths, one to the east and one to the northwest of the stations, almost every day, averaging seven to eight hours per day. (Author)

Stanford Research Inst., Menlo Park, Calif.
RESEARCH INVESTIGATIONS OF BEACON-TRACKING ANTENNAS FOR AEROBEE-HI AT WHITE SANDS MISSILE RANGE, by Harold S. Rothman. Final rept., Task IV, on Contract DA 36-039-sc-71205. June 59, 43p. 10 refs. AD-220 021.
Order from LC mi$3.30, ph$7.80 PB 145 937

A two-part investigation was made of the general nature of problems encountered in tracking the Aerobee-Hi missile at White Sands Missile Range. First, a system analysis was made of the response and interrogation function to determine the limitations of the present tracking equipment and to ascertain where significant improvement in system performance can be made. Second, a study was made to determine what antennas that were suitable for missile installation would provide the desired radiation patterns. The region of reliable tracking can then be determined from the allowable airborne equipment complexity and the radar receiving system parameters. (Author)

Stanford Research Inst., Menlo Park, Calif.
A SUMMARY OF LITERATURE PERTAINING TO RADIO STUDIES OF METEORS AND METEOR TRAILS, by W. R. Vincent and Frances H. Smith. Final rept. on Contract AF 19(604)1517. Jan 60, 383p. 1447 refs. SRI Project 1422; AFCRC-TR-59-367; AD-231 809.

Order from LC mi$11.10, ph$59.10 PB 145 975

A comprehensive survey of the literature pertinent to radio studies of meteors is presented. An abstract is given of each article, paper, report, or book that was available in English. A separate list without abstracts is given of material published in the Soviet Union and in Eastern European countries. (Author)

Sylvania Research Labs., Bayside, N. Y.
WIDEBAND OSCILLATOR TUBES, by J. A. Noland. Final rept. on Contract DA 36-039-sc-73147. 30 Apr 59, 31p. 2 refs. TR 59-1795.1, formerly YD 57-3, AD-225 215.
Order from LC mi$3.00, ph$6.30 PB 145 940

The design and constructional details of K-band backward wave oscillators are presented. These tubes are of all metal and ceramic construction and may be operated in a permanent magnet focusing field. One sample tube was built for each of the desired tuning ranges, 15 to 24, 27 to 41 and 24 to 38 kMc. Experimental data obtained on these tubes is presented. (Author) (See also PB 140 598)

Technische Hochschule, Darmstadt (West Germany).
RESEARCH ON PULSED IMAGE CONVERTER TUBES, by Otto Scherzer. Technical rept. on Contract AF 61(514)439. 30 Mar 55, 28p. 1 ref. EOARDC-TR-54; AD-95 486.
Order from LC mi$2.70, ph$4.80 PB 146 284

To find the best way of building an image converter which can be used as an electron-optical shutter for estremely short exposure times, the advantages of electric and magnetic electron lenses are analysed and compared. While magnetic lenses yield better images, electric lenses can be operated with pulses of not rectangular shape. For reasons of intensity and of space-charge effects, the voltage must be the higher, the shorter the exposure time is. Yet the production of high-voltage pulses of extremely short duration and of exactly rectangular shape is extremely difficult and expensive. Therefore it looks much more promising to start the investigation with electric lenses.

Union Thermoelectric Corp., Forest Park, Ill.
ABRASIVE GRADING AND THE LAPPING OF QUARTZ OSCILLATOR PLATES, by Wallace E. Richmond and Ralph P. Chalker. Special rept. on Contract DA 36-039-sc-71061. 15 Apr 58, 47p.
Order from LC mi$3.30, ph$7.80 PB 145 885

The uniformity of commercially available abrasives of the grades most used in the quartz crystal industry falls short of that needed in order to insure uniform rates of stock removal, or surfaces of uniform and predictable finish. Microphotographs are used to illustrate. (Author)

Upper Air Lab., U. of Colorado, Boulder.
A MINIATURE TRANSISTORIZED RADIOMETER FOR MEASUREMENT OF VISIBLE AND INFRARED RADIATION FROM HIGH ALTITUDE VEHICLES, by Frank E. Stuart. Scientific rept. no. 1 on Contract AF 19(604)1899. Sep 58, 37p. 8 refs. AFCRC-TN-58-610; AD-209 220.
Order from LC mi$3.00, ph$6.30 PB 137 836

Two models of this radiometer have been developed: one for measuring integrated radiation from the ultraviolet to the near infrared, with a long-wavelength cut off of approximately 4.5 microns; the other for measuring integrated infrared radiation from approximately 4 microns to 30 microns, which includes the spectral region containing most of the thermal radiation from the earth. Three radiometers have been built and operated a combined total of several hundred hours. Tests on these instruments show them to be fairly rugged and foolproof. Various modifications of the optics and filter system will permit this instrument to be adapted to a variety of tasks in which the intensity being measured is not too low. (Author)

Varian Associates, Palo Alto, Calif.
RESEARCH ON MOLECULAR AND ATOMIC RESONANCE DEVICES, by J. C. Helmer. Quarterly rept. no. 8, 1 Apr-30 June 59, on Contract DA 36-039-sc-73266. [1959] 29p. 6 refs. Engineering rept. no. 218-8Q; AD-226 026.
Order from LC mi$2.70, ph$4.80 PB 146 016

The problem of forming molecular beams for use in ammonia masers is examined. It is shown theoretically and experimentally that through the use of a new type of parabolic focuser with a point source effuser, the molecular flow may be reduced by a factor of 8, for the same power output, or the power output may be increased by a factor of 2 for the same molecular flow. A theory of beam formation in a multitube effuser is described. This shows that the most intense molecular beam is formed by an effuser of small overall diameter. Design considerations are discussed for parabolic, upper-state focusers, and for coaxial, lower-state focusers. The operation of a system is described using a lower-state focuser and an ionization detector in which lower-state molecules produced by maser oscillation may be detected. (See also PB 145 234)

Willow Run Labs., U. of Michigan, Ann Arbor.
THE EFFECT OF SYMMETRICAL LIMITING ON A SIGNAL CONSISTING ON N DISCRETE FREQUENCIES, by Kit-Yin Tieng. Rept. on Project Michigan, Contract DA 36-039-sc-52654. Mar 59, 20p. 16 refs. Rept. no. 2144-416-R.
Order from LC mi$2.40, ph$3.30 PB 145 786

An expression is derived for the output of a symmetrical limiter, when the input signal consists of N discrete frequencies. The output is expressed as a double summation, each with an infinite number of terms. The amplitude of each frequency component can be found, although calculations may become involved. The two cases, where N = 2 and N = 3, are considered and expressions for the output are given which are readily adaptable to calculations.

Willow Run Labs., U. of Michigan, Ann Arbor.
SOME RESULTS ON NOISE THROUGH CIRCUITS, by William M. Brown. Memo. on Proj. Michigan,

Contract DA 36-039-sc-78801. May 59, 22p. 7 refs. Memo. no. 2900-17-R; AD-216 941.
Order from LC mi$2.70, ph$4.80 PB 145 997

The general zero-crossing problem is analyzed for nonstationary noise. The zero-crossing rate is calculated in detail for the nonstationary noise consisting of the sum of stationary Gaussian noise and the following determinate signals: video pulse train, sine wave, and triangular wave. Also, the following two properties of the envelope of noise are established: (1) the mean square output of an envelope detector is twice the mean square input (independent of the statistics of the input), and (2) the derivative of the envelope of stationary Gaussian noise has a Gaussian first probability distribution. (Author)

Willow Run Labs., U. of Michigan, Ann Arbor.
TRANSPORT OF NOISE AT MICROWAVE FREQUENCIES THROUGH A SPACE-CHARGE-LIMITED DIODE, by W. E. Vivian. Technical rept. no. 34 on Proj. Michigan, Contract DA 36-039-sc-7880(78801. Feb 60, 21p. 15 refs. Rept. no. 2900-112-T.
Order from LC mi$2.70, ph$4.80 PB 145 991

Several analyses of the transport of cathode shopnoise through a space-charge-limited diode at microwave frequencies have been published to date. Each of these analyses has suffered from inconsistencies arising from assumptions of monovelocity perturbation flow, direct or reflected. A new method of analysis of diode flow eliminating this problem has been de veloped. Numerical results based on this method are presented here. Attention is restricted to the now classical problem of one-dimensional longitudinal confined flow. The magnitude and variation with distance of the so-called beam noise invariants is shown for a range of diode operating conditions. These calculated results, based for economy on an approximate static flow model, essentially substantiate the qualitative expectations suggested by prior analyses, and fit what few experimental data are available. The method of analysis employed in the calculation of the numerical results comprises a linear multistream formulation, based on representation or approximation of the perturbation particle density for the noise flow as a composite of singular impulse streams, N in number, along characteristic trajectories in the velocity-distance phase space. The resulting set of N ordinary linear differential equations which are coupled and of the first order, is solved by simultaneous numerical extrapolation. (Author)

Ordnance, Missiles, and Satellite Vehicles

Aberdeen Proving Ground, Md.
DESERT DURABILITY TEST, 1958, OF CODE A CONTINUOUS FIRE DETECTION DEVICE IN M48A2 TANK, by Philip J. Moravec and Edward L. Uhl, Jr. Rept. no. 1 on Ordnance Proj. no. IT-5093. 16 Oct 59, 20p. 6 refs. AD-227 151.
Order from LC mi$2.40, ph$3.30 PB 146 699

The Code A fire detection device was installed in an M48A2 Tank, to determine durability of the device, during 3082 miles of vehicle operation under desert environmental conditions. Durability and reliability of the fire detection device was generally satisfactory. It is recommended the fire detection device be considered sufficiently durable for use in military vehicles. (Author)

Air Force Missile Test Center, Patrick AFB, Fla.
ASKANIA CINE-THEODOLITE DATA REDUCTION MANUAL, by Eugene S. Smith. Rept. on Contract AF 08(606)1156. Jan 60, 146p. 26 refs. RCA Data Processing Technical rept. no. 56. AFMTC-TR-60-1.
Order from LC mi$7.20, ph$22.80 PB 146 762

The primary objective of this manual is to show how basic Askania Cine-theodolite data are obtained and utilized at AFMTC in determing the space coordinates of an object in flight. This manual is intended to be educational in view of the need for a reliable manual of Standard Operating Procedures to aid in training new employees in the procedures and techniques of theodolite data reduction. It is also intended to be a source of information for those agencies and individuals who utilize the reduced data by making the reduction procedures available to them.

Aircraft Armaments, Inc., Cockeysville, Md.
DEVELOPMENT OF AIRCRAFT CANOPY REMOVERS T14 AND T15, by Nicholas J. LaCosta. Rept. on Contract DA 36-034-507-ORD-50. Jan 57, 111p. 5 refs. Frankford Arsenal rept. no. R-1367; AD-129 784.
Order from LC mi$6.00, ph$18.30 PB 146 518

A report is made on the development of the T14 and T15 gas-fired aircraft canopy removers, and their performance is evaluated according to Frankford Arsenal specifications. The major improvements incorporated in the new removers were an aluminum firing pin and its shear pin, a modified locking arrangement, and silicone-rubber seals. The performance of both removers was consistent and exceeded the minimum characteristics put down by the Frankford Arsenal specification. Both removers are suitable for standardization. Studies and tests incidental in the investigation indicated that a 2-tube remover is possible which is capable of a performance equal to or greater than either of the 2 removers tested.

Army Ordnance Human Engineering Labs., Aberdeen Proving Ground, Md.
AN EVALUATION OF OBSERVER ERRORS IN SPOTTING ROUND FIRE CONTROL, by Robert T. Gschwind. Mar 60, 22p. Technical Memo. 4-60.
Order from LC mi$2.70, ph$4.80 PB 146 159

A field investigation was conducted at Aberdeen Proving Ground, Maryland to measure human errors associated with spotting round fire control. Ten mortar observers from Ft. George G. Meade were used to direct fire of a 60mm mortar at each of five 8' x 8' vertical targets randomly positioned within the range of the weapon. They were allowed 5 rounds to adjust fire and were instructed to call on target when they thought a round fell within 25 yds. of the

target. Nearly all the subjects thought they had determined the range after 5 rounds, however the distribution of range error when calling on target had an average deviation from the target of 7% of the range of the target. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
DEVELOPMENT AND RESEARCH OF AN AUTOMATIC BALLISTIC WIND DISPLACEMENT COMPUTER, by Robert J. Franklin. 10 Oct 58, 91p. 13 refs. USASRDL Technical rept. 1990; AD-212 479.
Order from LC mi$5.40, ph$15.30 PB 145 752

The automatic ballistic wind displacement computer predicts the wind displacement of the landing point of ballistic rockets in miles from the theoretical "no wind" impact point. These predeterminations are made with an automatic continuous computer using single theodolite techniques and yield a digital display of rectangular coordinate components of ballistic wind displacement for pilot balloon runs of up to 6 min. duration. With the balloon release mechanism the theodolite tracker can readily perform all necessary operations to effect a computation. Some of the possible variations in operation, output data and accuracy are indicated. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE DYNAMIC TESTER, by Robert H. Brunelle. June 59, 13p. Technical note no. 1261.
Order from LC mi$2.40, ph$3.30 PB 145 728

The Dynamic Tester is used in testing other devices, such as a fire control system, under realistically simulated dynamic conditions. Predetermined data, simulating a target in motion, are entered into the Tester on magnetic tape; and the test system's response is compared automatically against desired results based on the input data.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF PROBLEMS IN USING FLAT-ROLLED MATERIALS IN AIR- AND SPACE-WEAPON SYSTEMS, by F. W. Boulger. 14 Apr 60, 23p. 12 refs. DMIC memo. 52.
Order from OTS $0.50 PB 161 202

It has been estimated that, within 5 years, materials will be expected to operate at 1200 F for reasonably long times and at or above 2000 F for a few minutes. Within 10 years, operational temperatures are expected to reach 2500 F for a few minutes and 4000 F for a life of a few seconds. Therefore, this review deals mainly with problems in producing and using sheet materials intended for service at high temperatures.

Diamond Ordnance Fuze Labs., Washington, D. C.
HONEST JOHN HOB SELECTOR, by W. Hunter Boyd. 15 Dec 59, 19p. Technical rept. TR-794; AD-231 403.
Order from LC mi$2.40, ph$3.30 PB 146 078

The Honest John missile employs a device known as the HOB selector, the purpose of which is to allow the fuze to be manually preset to function at different settings for desired results. The present model of this device has undergone preservice testing in which its setting mechanism proved to be unreliable. To overcome the defects observed during these tests, DOFL has redesigned this HOB and constructed prototypes for production. The details to the redesign are described. The features of this design incorporated in prototype models of HOB's for the LaCrosse and Littlejohn missiles are briefly discussed. (Author)

Diamond Ordnance Fuze Labs., Washington, D. C.
MAGNITUDE OF IN-FLIGHT VIBRATION OF THE T2078E1 FUZE ON THE M31 ROCKET, by W. Gaylord. 11 Jan 60, 21p. TR-801; AD-232 435.
Order from LC mi$2.70, ph$4.80 PB 146 226

Four instrumented fuze housings were flight tested at Yuma Test Station, Arizona. The flights were conducted to obtain data relevant to the shock and vibration input environment of the T2078E1 fuze on the M31 rocket. The analyzed data show that the Honest John fuze housing experiences low-frequency input vibration of 30 to 500 cps and acceleration levels below 40 g for short periods during launch and burnout. The vibration which occurred during the remainder of flight did not have sufficient magnitude to be distinguished from noise. (Author)

Diamond Ordnance Fuze Labs., Washington, D. C.
RADIATION DAMAGE OF DC-TO-DC POWER CONVERTERS, by Paul A. Trimmer and Louis DeLuca. 29 Jan 60, 13p. 4 refs. Technical rept. TR-792; AD-232 333.
Order from LC mi$2.40, ph$3.30 PB 146 080

Semiconductor devices normally used in the dc converter of the T3022E1 fuze system were exposed to neutron radiation up to 0.7×10^{13}nvt from the Godiva bare critical assembly. Measurements of their characteristics were made before and after irradiation. The current gain (β) of the transistors was reduced by the neutron radiation to the extent that they would not function properly in the circuit. This was corrected by adding a biasing resistor to the base circuit of one of the transistors. The results of this study indicate that this unit will then operate reliably after being exposed to neutron radiation up to 0.7×10^{13}nvt. (Author)

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
DEVELOPMENT OF STATIC TEST CHARGE ASSEMBLY FOR SIMULATED DAVY CROCKETT ROUND, by Garry Weingarten and Joseph Kristal. Mar 60, 8p. 1 ref. Technical notes no. 39.
Order from LC mi$1.80, ph$1.80 PB 145 241

An assembly was developed containing 50/50 stabilized red phosphorus and finely divided (200/325 mesh) atomized magnesium which functioned without case fragmentation and provided good spotting characteristics at a distance of approximately 3000 yards.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
PREVENTION OF EXUDATION FROM AMMUNITION ITEMS, by Robert W. Heinemann and Stanley J. Lowell. Feb 60, 13p. 5 refs. Technical rept. 2675.
Order from LC mi$2.40, ph$3.30 PB 144 633

The problem of preventing exudation has been intensively investigated in the last few years. The investigation has proved that exudation can be prevented by either incorporating a calcium silicate absorbent (Spec X-PA-PD-1659) into the explosive filler or placing the same absorbent on top of the explosive filler. Results of tests conducted with T34E2 warheads show that incorporating the absorbent into the explosive filler is the better of the two techniques studied. Further, an amount of absorbent equal to 1.25% of the TNT content is needed to prevent exudation from TNT-containing explosives.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
TEST METHODS FOR POSITIVE IDENTIFICATION OF FLEXIBLE BARRIER MATERIALS, by Roswell H. Evans. Jan 60, 11p. Technical Notes no. 38.
Order from LC mi$2.40, ph$3.30 PB 145 824

Tests have been developed for the evaluation and positive identification of representative currently used non-asphaltic, flexible barrier materials. (Author)

[General Electric Co., Schenectady, N. Y.]
ALTITUDE-TIME TESTS OF MODEL 85 TENNEY ALTITUDE CHAMBER LOCATED IN DEVELOPMENT LABORATORY, by R. W. Ottaway and Glen E. McIntosh. 12 Aug 52, 5p. Heat Transfer memo. no. 44.
Order from LC mi$1.80, ph$1.80 PB 145 980

General Electric Co. [Schenectady, N. Y.]
ESTIMATION OF TRANSIENT TEMPERATURE OF NOSE DOOR SEAL HA-3B, by Helen G. Bass and William W. Fischer. 6 Oct 52, declassified, 3p. Hermes Heat Transfer memo. no. 53.
Order from LC mi$1.80, ph$1.80 PB 145 917

The object was to estimate the during flight temperature of the rubber seal of the nose doors for the HA-3B missile. No attempt is made herein to determine the overall satisfactoriness of the design investigated.

[General Electric Co., Schenectady, N. Y.]
AN OUTLINE OF THE NUMERICAL METHOD USING A DESK CALCULATOR FOR THE DETERMINATION OF NOZZLE WALL TEMPERATURES, by Allen E. Galson and W. W. Fischer. 9 Sep 52, 6p. 4 refs. Proj. Hermes Heat Transfer memo. no. 46.
Order from LC mi$1.80, ph$1.80 PB 145 982

National Bureau of Standards, Washington, D. C.
EXPERIMENTAL PLATING OF GUN BORES TO RETARD EROSION, by Vernon A. Lamb and John P. Young. May 60, 99p. 35 refs. Technical note no. 46.
Order from OTS $2.50 PB 151 405

Methods for plating the bores of gun barrels are described, including details of fixture design, solution composition, and operating conditions. Extensive firing tests were performed, which show that chromium plate increases the life of barrels about 2- to 5-fold, depending on the type and caliber of barrel. Optimum thickness of plate ranges from 0.0015 inch in the smallest calibers to 0.015 inch in cannon. Certain modifications of the barrels enhance the improvement provided by the chromium plate. Chromium plating has been adopted as standard production practice for caliber 0.30, 0.50, and 20 mm barrels, and for several calibers of cannon.

Naval Ordnance Lab., White Oak, Md.
THE HARMONIC GENERATION TECHNIQUE FOR THE DETERMINATION OF THERMAL CHARACTERISTICS OF WIRE BRIDGES USED IN ELECTRO-EXPLOSIVE DEVICES, by Louis A. Rosenthal. 9 Sep 59, 26p. NAVORD rept. 6691. AD-231 918.
Order from LC mi$2.70, ph$4.80 PB 146 252

The thermal equations for a wire bridge or equivalent electro-explosive device are presented. When a sinusoidal current passes through such a thermally sensitive resistance, it is capable of generating a third harmonic voltage which is a measure of the resistance's ability to follow the instantaneous cycling power fluctuations. By measuring the variation of this third harmonic with frequency it is possible to determine the thermal time constant with good accuracy. The heat equations are also verified. Confirming experimental data are presented. (Author)

Naval Ordnance Test Station, China Lake, Calif.
NOTS SUPERSONIC TRACKS, by Frank H. Haymaker. 1 July 58, 41p. NOTS rept. no. 1938; AD-200 540.
Order from LC mi$3.30, ph$7.80 PB 146 057

This booklet is written expressly to acquaint potential users with the testing services and facilities available at the NOTS supersonic tracks. The facts presented here should materially shorten the time between the developing agency's realization that a testing problem is forthcoming and the acquisition and assessment of the test data.

Naval Research Lab., Washington, D. C.
RADIOMETRIC BEHAVIOR OF HIGH EXPLOSIVES AT REDUCED PRESSURE, by M. Cavanagh and A. Rockman. Final rept. 15 Feb 60, 9p. 2 refs. NRL rept. 5432.
Order from LC mi$1.80, ph$1.80 PB 143 941

Radiometric measurements of exploding pentolite at sea-level atmospheric pressure and at simulated altitudes of 50,000 and 100,000 feet were made at the U. S. Naval Ordnance Laboratory using a ballistic thermopile and a high-speed streak camera. At 50,000 feet, an unexpected maximum of total thermal radiation was encountered. This is higher by a factor of 10 than the total thermal radiation measured at sea level and higher by a factor of 2 than the yield measured at 100,000 feet. While this phenomenon is real, it is unexplained. (Author)

North Carolina State Coll., Raleigh.
A PRELIMINARY REPORT ON THE DYNAMICS OF SATELLITE MOTION, by Raimond A. Struble. Rept. on Contract DA 36-034-ORD-2733. Jan 60, 20p. 9 refs. OOR rept. 2125.4-M; AD-231 185.
Order from LC mi$2.40, ph$3.30 PB 145 711

Office of Scientific Research and Development. Div. 6.
TORPEDO STUDIES. Summary technical rept. vol. 21, Contract OEMsr-1131. 1946, declassified 17 July 58, 167p. 93 refs.
Order from LC mi$7.80, ph$25.80 PB 139 774

Office of Scientific Research and Development. Div. 7.
AIRBORNE FIRE CONTROL. Summary technical rept. vol. 3, Contract OEMsr-1131. 1946, declassified 23 Apr 58, 256p. 296 refs.
Order from LC mi$11.10, ph$39.60 PB 139 787

Office of Scientific Research and Development. Div. 7.
GUNFIRE CONTROL. Summary technical rept. vol. 1, Contract OEMsr-1131. 1946, declassified 23 Apr 58, 196p. 163 refs.
Order from LC mi$8.40, ph$28.80 PB 139 789

Picatinny Arsenal, Dover, N. J.
PROPERTIES OF EXPLOSIVES OF MILITARY INTEREST, by W. R. Tomlinson, Jr. rev. by Oliver E. Sheffield. Apr 58, 363p. 331 refs. Technical rept. no. 1740, rev. 1.
Order from LC mi$11.10, ph$54.60 PB 145 974

The 81 explosive compounds or mixtures and their properties - including composition variations for a given type - were selected for inclusion in this manual because of their current or future interest or due to past or present application in military items. The tabulated data reflect the results of tests which measure sensitivity to friction, impact, heat, initiation; performance characteristics or effectiveness in weapons; and physical and chemical properties of the explosive. A method of preparation, synthesis or manufacture is included for each type of explosive.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
APPLICATION OF FRACTURE MECHANICS TO RECOILLESS RIFLE PROBLEMS, by C. M. Carman. Sep 59, 31p. 15 refs. Rept. R-1521; AD-231 923.
Order from LC mi$3.00, ph$6.30 PB 146 003

The principles of fracture mechanics are briefly reviewed. Included in this review are the equations for circumferentially notched bars in tension, centrally notched sheet specimens in tension, plastic strain zone correction, conditions for plain strain fracture, and maximum flaw size with its practical limitations. Fracture toughness values for 4330V (Mod + Si) steel. Vasco-Jet 1000 steel, and 300-M steel have been determined, using circumferentially notched specimens. These values have been corrected for plastic strain zone, analyzed for plain strain conditions, and used to determine maximum flaw size. (Author)

Rock Island Arsenal Lab., Ill.
STABILITY OF HARD ELECTRODEPOSITED CHROMIUM, by J. W. McGarvey. 20 Nov 59, 23p. 6 refs. Rept. no. 59-2989; AD-231 485.
Order from LC mi$2.70, ph$4.80 PB 145 894

Several samples of hard electrodeposited chromium were studied utilizing X-ray diffraction, light microscopy, and electron microscopy to determine if any structural modifications could be detected in aged specimens. All of the deposits examined were found to be in the normal body-centered cubic form and exhibited no detectable modifications after aging at normal atmospheric temperatures. Heat treatment at 450 F did not affect the body-centered cubic form of the deposits although it did widen the cracks which were present.

Utah U., Salt Lake City.
SPECTRAL ANALYSIS OF THE IMPACT OF ULTRA VELOCITY COPPER SPHERES INTO COPPER TARGETS, by J. S. Clark, R. R. Kadesch, and R. W. Grow. Technical rept. no. OSR-16 on Contract AF 49(638)462. 1 Sep 59, 56p. 16 refs. AFOSR-TN-60-13; AD-232 499.
Order from LC mi$3.60, ph$9.30 PB 146 005

Spectrographic observations were made for Cu projectiles impacting into Cu targets in various controlled atmospheres. Atomic Cu lines are the predominant feature of the impact flash of Cu-to-Cu impacts in a medium of Ar.

White Sands [Missile Range] N. Mex.
ASKANIA CINE-THEODOLITE PROCEDURE, by Freda P. Apostolas. Aug 57, 62p. 5 refs. Technical memo. 446; AD-139 343.
Order from LC mi$3.90, ph$10.80 PB 146 697

The description of Askania Theodolite cameras and the procedures followed in the reduction of data from Askania films are discussed in this report, which is a summary of camera descriptions, reading equipment, least-square solution, and determination of errors in the final data. The purpose of this report is to serve as an introduction to procedures and a reference manual for those interested in data reduction from Askania films. (Author)

Ship Building

George Washington U., Washington, D. C.
EVALUATION OF DATA FOR THE USS TIRU (SS 416), SUPPLEMENT, by J. E. Hamilton. Rept. on Logistics Research Proj. Contract Nonr-761(05). 11 May 59, 108p. Serial T-98(a)/59.
Order from LC mi$5.70, ph$16.80 PB 145 964

Office of Scientific Research and Development. Div. 6.
METHODS OF SUBMARINE BUOYANCY CONTROL. Summary technical rept. vol. 6B, Contract OEMsr-1131. 1946, declassified 17 July 58, 89p. 49 refs.
Order from LC mi$4.80, ph$13.80 PB 139 776

Technical Research Group, Syosset, N. Y.
ON SHIP FORMS HAVING MINIMUM WAVE RESISTANCE, by Samuel Karp, Jack Kotik, and Jerome Lurye. Scientific rept. on 1 on Contract Nonr-2427(00). 20 Mar 59, 60p. 16 refs. Rept. on TRG-119-SR-1.
Order from LC mi$3.60, ph$9.30 PB 145 793

In the present paper, which deals with the strut of minimum wave resistance, this difficulty is resolved by formulating the problem in a manner different from usual. The reformulated problem is then shown to have a unique solution in the form of a minimizing hull shape which, while not precisely a strut, is nevertheless very closely related to one in two ways: (1) to the first order in some parameter expressing the thinness, e.g., the width at the midsection, the minimizing shape is a strut, and (2) the shape approaches a strut asymptotically for large depths. Associated with the process of obtaining this solution are several mathematical steps which are still to be justified rigorously, but provisionally they appear correct.

FOOD, HANDLING, AND PACKAGING EQUIPMENT

Food

Quartermaster Research and Engineering Center, Natick, Mass.
OCCURRENCE OF HIGH TEMPERATURES IN YUMA STORAGE DUMPS, by William L. Porter and Nico H. Roos. Nov 59, 72p. 15 refs. Technical rept. EP-121; AD-231 917.
Order from LC mi$4.50, ph$12.30 PB 146 064

Temperature in 4 differently protected storage-dump stacks were studied under extreme hot-dry conditions on desert terrain at Yuma, Arizona, during a 43-day period. Carton air and food temperatures were recorded in stacks exposed in the following ways: (1) open and unprotected; (2) protected by a raised paulin fly; (3) protected by a tightly-lashed paulin; and (4) protected by a raised paulin fly with addition of reflective foil laid on the stack surface. In both extremes and means of temperature, the tightly-covered paulin stack is a much more severe storage environment than the other three types observed, which differ little among themselves in long-term storage stress. In these three stacks, those having greater stack protection showed a reduction in maximum temperatures, range of temperature and duration of higher temperatures, but effective storage temperatures were similar. Mean storage temperature tended to rise with increased airmass moisture, because daily minimum temperatures were raised by back radiation from water vapor and the prevailing thin, high, nocturnal cloudiness.

Texas Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD, by L. R. Richardson. Progress rept. for 1 Sep 54-1 Jan 55 on Contract DA 49-007-MD-582. [1955] 8p.
Order from LC mi$1.80, ph$1.80 PB 146 663

Three studies were started September 1, 1954. These were: (1) A study of the effect of an irradiated diet of the mother on the offspring. (2) A longevity study to determine whether irradiation of a food affects of the life span of an animal. (3) A study of the effect of irradiation of the diet on its folic acid content using chicks as the experimental animals. The results obtained are described in this progress report. Rats were used in (1) and (2).

Texas Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAl PROPERTIES OF IRRADIATED FOOD, by L. R. Richardson. Progress rept. 2, 1 Sep 54-1 Apr 55, on Contract DA 49-007-MD-582. [1955] 8p.
Order from LC mi$1.80, ph$1.80 PB 146 664

All data obtained since this project was initiated in September 1954 are given in this report. The effect of an irradiated diet of the mother on the offspring. Observations on the first generation. Incidence of blindness in offspring of mothers receiving various diets. Effect of an irradiated diet on the growth and life span of rats. An irradiated diet and the growth of chicks. An irradiated diet, the survival of chicks, and hematocrit value. (See also PB 146 663)

Texas Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD, by L. R. Richardson. Progress rept. 3, 1 Sep 54-1 July 55, on Contract DA 49-007-MD-582. [1955] 8p. AD-96 317.
Order from LC mi$1.80, ph$1.80 PB 146 668

All data obtained since this project was initiated in September 1954 are given in this report: The effect of an irradiated diet of the mother on the offspring; Observations on the first and second generations; A long range effect of an irradiated diet on reproduction rats - observations on litters; The incidence of blindness in offspring; Effect of an irradiated diet on the growth and life span; An irradiated diet and the growth of chicks; Folic acid content of tissues; Enzymes. (See also PB 146 664)

Texas Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD, by L. R. Richardson. Progress rept. 4, 1 July-1 Oct 55, on Contract DA 49-007-MD-582. [1955] 14p.
Order from LC mi$2.40, ph$3.30 PB 146 667

All data obtained on reproduction and longevity studies with rats since this project was initiated in September 1954 are given in this report. The effect of an irradiated diet of the mother on the offstpring. Observations on the first, second and third generations. (See also PB 146 668)

Texas Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD, by L. R. Richardson. Progress rept. 5, 1 Oct 55-1 Jan 56, on Contract DA 49-007-MD-582. [1956] 21p.
Order from LC mi$2.70, ph$4.80 PB 146 666

Four generations of rats receiving irradiated and untreated diets have been started in reproduction and longevity studies. As measured by the number and percent of young weaned, the irradiated diet is equal to the untreated diet for reproduction and lactation in the first and second generation, but inferior to the untreated diet in the third generation. With regard to life span, so far, the irradiated and untreated diet have been equal in nutritive value. Chicks receiving an irradiated diet supplemented with vitamins A, D and E consistently grew at a slightly slower rate than those receiving the untreated diet. When the complete diet was irradiated and was not supplemented with vitamins A, D and E, the chicks grew slowly and the mortality was high. Definite symptoms of vitamins A and E deficiency were evident. Studies carried out to determine the effect of irradiation on individual vitamins show that the vitamin K activity of menadione and vitamin K_5 was destroyed by irradiation at a dose of 3 X 10 rep. Choline was not affected by irradiation of the diet or by irradiation of a solution of choline. Endogenous respiration of liver homogenate from rats receiving an irradiated diet increased over 100 percent, but there was no significant change in the liver cytrochrome oxidase or liver xanthine oxidase. (See also PB 146 667)

Texas Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD, by L. R. Richardson. Progress rept. 6, 1 Jan 56-1 Apr 56, on Contract DA 49-007-MD-582. [1956] 22p.
Order from LC mi$2.70, ph$4.80 PB 146 665

Observations on four generations of rats receiving irradiated and untreated diets have continued in reproduction and longevity studies. As measured by the number and percent of young weaned, the irradiated diet is essentially equal to the untreated diet for reproduction and lactation in the first and second generation. The irradiated diet has been slightly inferior to the untreated diet in the third generation. Females in the fourth generation which received either the irradiated or untreated diet have weaned a small percent of their young. However, there was no essential difference in the two diets. With regard to length of life, the irradiated and untreated diets are about equal in nutritive value. With regard to growth, the untreated diet is slightly superior to the irradiated diet in seven out of eight cases. The difference between the weights of males has been greater than that between the females. The males in first and second generations which received the irradiated diet appear to be loosing weight slightly faster than those receiving the untreated diet. Studies with chicks during the past three months have been chiefly to check some of the earlier trials. Observations agree with those given in Progress Report V and it is concluded that choline is not destroyed by irradiation of the diet. (See also PB 146 666)

Texas Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD, by L. R. Richardson. Progress rept. 7, 1 Apr-1 July 56, on Contract DA 49-007-MD-582. [1956] 23p.
Order from LC mi$2.70, ph$4.80 PB 146 669

The percent of young weaned was less on irradiated diet. The number of young born per litter has been essentially the same in both groups. Rats have consumed approximately the same amount of diet in both groups. The incidence of blindness was slightly higher in young from the irradiated diet. Chicks receiving irradiated diets consistently grew at a slower rate than those receiving the untreated diet. Chicks receiving a solution which contained a mixture of thiamine, pyridoxine, riboflavin, pantothenic acid and folic acid, that had been irradiated, developed typical symptoms of thiamine and pantothenic acid deficiency when the solution was supplied at a low level. When the quantity supplied was in excess, the irradiated and untreated solutions were approximately equal. (See also PB 146 665)

Texas Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD, by L. R. Richardson. Progress rept. 8, 1 July-1 Oct 56, on Contract DA 49-007-MD-582. [1956] 19p.
Order from LC mi$2.40, ph$3.30 PB 146 670

The observations on the rats are essentially the same as those given in Progress Report VII. The results with irradiated protein were variable, and definite conclusions were impossible with regard to specific effects of irradiation. Preliminary studies indicated that biotin activity of a diet or of a solution were not decreased by the irradiation procedure. (See also PB 146 669)

Texas Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITIONAL PROPERTIES OF IRRADIATED FOOD, by L. R. Richardson. Progress rept. 9, 1 Oct 56-1 Jan 57, on Contract DA 49-007-MD-582. [1957] 16p.
Order from LC mi$2.40, ph$3.30 PB 146 671

The percent of litters and of young weaned in the four generations was slightly less on the irradiated diet. Twenty females in the irradiated group in the first and second generations produced a larger total number of young than the same number in the untreated.

The untreated group produced a large total number of young in the third and fourth generations. The number of young per litter was essentially the same in both groups. The incidence of blindness continued to be higher in young from females receiving the irradiated diet. Vitamins A and alpha tocopherol were destroyed when the complete diet was irradiated. There was some destruction of thiamine, riboflavin, pyridoxine, pantothenic acid and folic acid when a solution containing these vitamins was irradiated. A diet composed entirely of irradiated foods should be supplemented with a complete vitamin mixture in order to insure an adequate supply of vitamins. (See also PB 146 670)

Texas Agricultural Experiment Station, College Station.
A LONG RANGE INVESTIGATION OF THE NUTRITION PROPERTIES OF IRRADIATED FOOD, by L. R. Richardson. General progress rept. 12 (Progress rept. 4 on Long Term Feeding Study on Chicken and Green Beans) 1 Mar-15 Sep 58, on Contract DA 49-007-md-582.
Order from LC mi$2.70, ph$4.80 PB 146 849

Rats receiving various combinations of control and irradiated chicken and green beans have been observed in parent, F_1 and F_2 generation. Growth, fertility and reproduction, weights of organs, and hematological values were within normal of the rats receiving control and green beans and chicken or green beans and chicken irradiated at a dose level of 2.79×10^6 rad or 5.58×10^6 rad. It is concluded that irradiation at the two dose levels has not decreased the nutritive value of the green beans and chicken. A urinary discharge is prevalent in mature male rats and renal stones were found in kidneys and bladders of both male and female rats. The abnormalities were present in rats receiving the control green beans and chicken and therefore their presence is not attributed to irradiation of the food. A second test on the incidence of congential blindness shows that the incidence is still higher in the young from mothers receiving the irradiated than in those from mothers receiving the non-irradiated diet. Repeat tests with irradiated pork and beef fatty tissue confirm the observations described in earlier reports, that diets containing control beef fatty tissue could be stored for 3 weeks without serious loss in nutritive value. Diets containing control pork fatty tissue decreased in nutritive value. Preliminary tests indicated that prolonged prothrombin times developed in male rats receiving diets containing irradiated beef or diets containing untreated beef and oxidized cod liver oil or oxidized wheat germ oil. (See also PB 146 848)

Texas Agricultural Experiment Station, College Station.
A LONG TERM FEEDING STUDY ON CHICKEN AND GREEN BEANS, by L. R. Richardson. Progress rept. 1 on Contract DA 49-007-md-582. [1957] 9p. AD-144 188.
Order from LC mi$1.80, ph$1.80 PB 146 847

A study is being conducted on chicken and green beans irradiated at different dose levels. The gain in weight of individual male and female rats receiving these foods was recorded after 12 weeks. There was no difference between the rats that received the control diet and those that received any combination of the irradiated chicken and green beans. Hematological studies revealed no difference between the control rats and the test subjects.

Texas Agricultural Experiment Station, College Station.
A LONG TERM FEEDING STUDY ON CHICKEN AND GREEN BEANS, by L. R. Richardson. Progress rept. 2 on Contract DA 49-007-md-582. 31 Oct 57, 11p. AD-150 174.
Order from LC mi$2.40, ph$3.30 PB 146 848

Young have been produced by every female receiving the irradiated and control chicken and green bean diets in the reproduction study. A few males have not sired litters; however, the percentage of male siring litters in the irradiated group was higher than in the control group. Overall data obtained so far indicate that the nutritive value of the irradiated foods is essentially the same as that of the non-irradiated. (See also PB 146 847)

Vanderbilt U. School of Medicine, Nashville, Tenn.
LONG-TERM FEEDING EXPERIMENT ON IRRADIATED CHICKEN, BEEF AND JAM, by Frank R. Blood. Progress rept. no. 3-A, 13 June-15 Sep 58 on Contract DA 49-007-md-779. [1958] 13p.
Order from LC mi$2.40, ph$3.30 PB 146 822

The beagles have now been fed irradiated foods for thirty-six weeks. Diets containing 35% of solids of boned chicken, ground beef, and pineapple jam irradiated at 0-, 2.79- and 5.58 megarads have continued to be acceptable to all animals. Hematologic examinations performed at the close of this period reveal normal values for all dogs. Urine analyses done after thirty-six weeks continue to reveal that the dogs receiving the jam diet, which has a high sugar content, continue to have glycosuria. A negative Benedict and albumin test were obtained on all dogs on the chicken and beef diets. During the first nine months of feeding no other effects have been noted in any of the animals. (Author)

Vanderbilt U. School of Medicine, Nashville, Tenn.
LONG-TERM MONKEY FEEDING EXPERIMENT ON IRRADIATED PEACHES, WHOLE ORANGES AND PEELED ORANGES, TWELFTH TO TWENTY-FOURTH WEEK, by Frank R. Blood. Progress rept. no. 2-B, 14 Apr-12 July 58, on Contract DA 49-007-md-779. [1959] 15p.
Order from LC mi$2.40, ph$3.30 PB 146 824

The long-term feeding experiment with monkeys to determine the wholesomeness of irradiated peaches, whole oranges and peeled oranges has been continued as described in Progress Report No. 1 for Monkeys. Hematologic examinations made during the twenty-fourth week show normal values for hemoglobin, PCV and white blood cell count, but both the control and experimental animals have a high eosinophil count. However, an eosinophilia is present in most of the monkeys in the colony at Vanderbilt and does not

appear to be related to feeding diets containing irradiated foods. Other than the eosinophilia, the animals have appeared normal during the first six months of the experiment, with no effects directly related to the incorporation of irradiated foods in the diet. (Author)

Vanderbilt U. School of Medicine, Nashville, Tenn.
LONG-TERM MONKEY FEEDING EXPERIMENT ON IRRADIATED PEACHES, WHOLE ORANGES AND PEELED ORANGES, TWENTY-FOURTH TO THIRTY-SIXTH WEEK, by Frank R. Blood. Progress rept. no. 3-B, 12 July-12 Oct 58, on Contract DA 49-007-md-779. [1958] 15p.
Order from LC mi$2.40, ph$3.30 PB 146 821

Rhesus Monkeys receiving irradiated peaches, whole oranges and peeled oranges have been on experimental diets for thirty-six weeks. This long-term feeding experiment has been continued as described in Progress Reports No. 1 and No. 2-B for Monkeys. Hematologic examinations of these animals continue to show normal values. The eosinophil counts, which were found to be high after twenty-four weeks (Progress Report No. 2B), have returned to normal in all but one monkey in the group receiving peaches and show improvement in those monkeys receiving whole and peeled oranges. One monkey on X-level peeled oranges expired during this period from dysentry. No effects due to the toxicity of the irradiated foods have been noted. (Author) (See also PB 146 824)

Vanderbilt U. School of Medicine, Nashville, Tenn.
LONG-TERM RAT FEEDING EXPERIMENT ON IRRADIATED BEEF, TWELFTH TO TWENTY-FOURTH WEEK, by Frank R. Blood. Progress rept. no. 2C, 3 June-3 Sep 58, on Contract DA 49-007-md-779. [1958] 18p.
Order from LC mi$2.40, ph$3.30 PB 146 823

The long-term feeding experiment of irradiated beef to three replicates of rats to determine the wholesomeness of irradiated food stored 6 months at room temperature has been continued as described in Progress Report No. 1 for rats. Replicate No. 2B (rats receiving no vitamin supplements) has also been continued. During the first twenty-four weeks of feeding no effects related to the toxicity of the irradiated beef have been noted. (Author)

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Engines and Propulsion Systems

Aerojet-General Corp., Azusa, Calif.
CHARGED-COLLOID PROPULSION SYSTEM, by R. D. Schultz and L. K. Branson. Rept. on Contract AF 49(638)656. Dec 59, 35p. 24 refs. Rept. no. 1728; AFOSR-TN-60-212; AD-230 620.
Order from LC mi$3.00, ph$6.30 PB 146 178

Theoretical and experimental research is described leading toward a space propulsion system in which microscopic oil droplets are produced with a high positive charge and accelerated electrostatically to exhaust velocities of over 50,000 miles per hour with a specific impulse of over 2200 seconds. This type of rocket system may prove to be of considerable value for controlling the orbit of an earth satellite, for earth-moon missions, and possibly for deep-space exploration such as a Mars or Venus probe. (Author)

Aerosciences Lab., General Electric Co., Philadelphia, Pa.
EXPERIMENTAL INVESTIGATIONS OF PLASMA ACCELERATORS FOR SPACE VEHICLE GUIDANCE AND PROPULSION, by Bernard Gorowitz, K. Moses, and P. Gloersen. Rept. on Contract AF 04(647)269. 23 Nov 59, 25p. 5 refs. Technical Information Series R59SD466. AD-230 770.
Order from LC mi$2.70, ph$4.80 PB 145 717

A description is given of experimental studies concerning the possible application of a pulsed plasma accelerating device for space propulsion and attitude control. The particular laboratory model discussed employs an electric discharge to create a plasma which is electromagnetically accelerated into a high vacuum chamber. Specific impulses obtained with the accelerator have been in the range of 1000-20,000 seconds. Measurements indicate efficiency of conversion of stored electrical energy to mechanical energy as high as 60%.

Armed Services Technical Information Agency, Arlington, Va.
ROCKET PROPELLANTS. Report Bibliography. Mar 60, 59p. 292 refs. AD-233 500.
Order from OTS $1.50 PB 161 654

The bibliography is a compilation of approximately 292 abstracts of unclassified reports on liquid and solid propellants which were added to the ASTIA collection from 1953 to 15 Feb 1960. The first part of the bibliography includes separate sections dealing with general information on solid rocket propellants and on liquid rocket propellants. The second part of the bibliography includes sections for each of the following compositions used in rocket propellants: (1) acetylenes, (2) amines, (3) ammonia, (4) ammonium perchlorate, (5) boron hydrides, (6) ethylene oxide, (7) fluorine, (8) hydrazines, (9) hydrocarbons, (10) hydrogen, (11) hydrogen peroxide, (12) lithium compounds, (13) methanol, (14) nitric acid, (15) nitrogen, (16) nitrogenfluorine compounds, (17) nitrogen oxides, (18) nitroparaffins, (19) oxygen, (20) ozone, (21) perchloryl fluoride, and (22) thiophosphites. Abstract entries in each subdivision of the first and second parts are arranged alphabetically by corporate author, numerically by contract number and by date. Only final or summary reports were included in the bibliography, except when the final report was not received or when a progress report contained significant information which was not included in the final report. A bibliography of confidential entries on solid and liquid propellants (AS-315 500) was compiled separately. (Author)

James Forrestal Research Center, Princeton, N. J.
PROJECT SQUID. Semi-annual progress rept. for 1 Oct 58-31 Mar 59 on Contract Nonr-1858(25). 1 Apr 59, 101p. 49 refs.
Order from LC mi$5.70, ph$16.80 PB 145 886

Covers work done in the following four fields: Fluid mechanics, transport and transfer processes, chemical kinetics, combustion phenomena.
(See also PB 137 703)

Jet Propulsion Center, Purdue U., Lafayette, Ind.
EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER BY FORCED CONVECTION FROM THE HOT GAS TO A COOLED STAINLESS STEEL RADIAL INFLOW GAS TURBINE ROTOR, by Thomas R. Swartwout. Final rept. on Contracts N7onr-394(15) and Nonr-1100(10). Jan 58, /8p. 22 refs. Rept. no. F-58-2; PRF 688 and 1499.
Order from LC mi$4.50, ph$12.30 PB 138 325

An investigation was made of the heat transferred by forced convection from the hot gases flowing through a 12.2 inch diameter radial in-flow turbine rotor fabricated from Universal-Cyclops A-286 alloy, to the cooling air flowing over the back surface of the rotor. The cooling air was injected near the tip of the rotor, flowed over the back surface of the rotor, and was discharged around the shaft. The turbine was operated with turbine inlet gas temperatures of 800 F, 1050 F, and 1200 F; pressure ratios of 1.5 to 1.8; and coolant ratios (weight rate of flow of cooling air/weight rate of flow of turbine gases) of 4 to 7 per cent; all experiments were conducted at a constant rotor speed of 16,000 rpm. The correlation of the heat transfer film coefficients for the hot gas side of the rotor previously developed at the Gas Turbine Laboratory, Purdue University, from experiments with lower turbine inlet temperatures was verified with the data obtained at the higher turbine inlet gas temperatures by employing a thermal analyzer based on the analogy between the flow of heat and of electricity.

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE SYNTHESIS OF RESIN INTERMEDIATES BY REACTIONS WITH ETHYLENE OXIDE, by Peter L. Nichols, Jr., John D. Ingham and others. Rept. on Contract DA 04-495-ORD-18. 16 Sep 54, 49p. 38 refs. Rept. no. 20-84.
Order from LC mi$3.30, ph$7.80 PB 146 856

The chemistry of the openings of the ethylene oxide ring has been studied from the viewpoint of developing synthetic methods for the preparation of new and useful propellant materials and their intermediates. Experimental conditions were chosen such that the ring openings proceeded by the familiar bimolecular nucleophilic substitution reaction. Acid-catalyzed and uncatalyzed additions were studied in both aqueous and nonaqueous media.

Plasma Propulsion Lab., Republic Aviation Corp., Farmingdale, N. Y.
SOME ENGINEERING ASPECTS OF THE MAGNETOHYDRODYNAMIC PINCH PROCESS FOR SPACE PROPULSION, by Irving Granet and William J. Guman. Rept. on Contract AF 49(638)552. Nov 59, 44p. 16 refs. PPL Rept. no. 120; AFOSR-TN-60-86.
Order from LC mi$3.30, ph$7.80 PB 145 841

This paper is divided into three sections: (1) A description of several analytical models currently in use to describe the pinch process, the approximations contained in each, and their limitations. (2) Based upon conclusions drawn from Section I, the "snow plow" (4) method was selected for a systematic analysis of a propulsion system with various combinations of the input parameters. (3) Conclusions based upon the analytical, computational and experimental work are given and some comparison is made with work reported in the current technical literature.

Rocketdyne, Canoga Park, Calif.
ACCELERATOR DESIGN TECHNIQUES FOR ION THRUST DEVICES, by S. L. Eilenberg. Rept. on Contract AF 49(638)344. 12 Feb 59, 45p. 7 refs. R-1430; AFOSR TN-59-194.
Order from LC mi$3.30, ph$7.80 PB 139 229

This report summarizes many of the problems associated with the ion accelerating section of the ion thrust device. Several methods for designing an ion accelerator are discussed and a specific design calculation is performed. A generalized description of a variety of ion accelerator geometries is presented.

Manufacturing Equipment and Processes

Aeon Labs., Egham, Surrey (Gt. Brit.)
A STUDY OF METAL CUTTING BY THE EXAMINATION IN THE ELECTRON MICROSCOPE OF SECTIONS CUT WITH A DIAMOND KNIFE, by R. Phillips. Annual technical rept. (Final) for 1 Dec 58-30 Nov 59 on Contract DA 91-591-EUC-989. 30 Nov 59, 43p. 5 refs. AD-231 399.
Order from LC mi$3.30, ph$7.80 PB 145 952

A transmission electron optical study of thin sections of cubic metals showed that the cutting process produced (1) broad bands of variable width in the direction of cutting (knife marks), (2) folds normal to the direction of cutting, and (3) a structure consisting basically of parallel lines of the order of 500 A spacing approximately normal to the direction of cutting.

Aeroprojects, Inc., West Chester, Pa.
FUNDAMENTALS OF ULTRASONIC WELDING. PHASE I, by J. Byron Jones, Nicholas Maropis and others. Final rept. for 1 Dec 57-1 Dec 58 on Contract NOas 58-108-c. May 59, 109p. 18 refs. Research rept. no. 59-105.
Order from OTS $2.50 PB 161 677

The investigations are oriented to the development of a phenomenological theory of ultrasonic or vibratory welding that will account for the observed effects. This Phase I of an extended research program is concerned with the development of techniques to permit quantitative investigation of the internal cyclic stresses, transient temperatures, and net energy associated with the generation of such metallurgical

bonds. Preliminary information on the energy required to generate ultrasonic welds in several materials was obtained with a view to predicting ultrasonic weldability in terms of the more familiar material properties. (Author)

Air Materiel Command, Wright-Patterson AFB, Ohio.
PRYM PROCESS OF FABRICATING SEAMLESS HOLLOW BLADES FOR GAS TURBINES, by R. W. Biddle. 5 Nov 53, declassified [4 Sep 48]. 36p. F-TR-2146-ND; ATI-23 288.
Order from LC mi$3.00, ph$6.30 PB 146 164

A detailed description of the process, material, and equipment used in the fabrication of hollow turbine blades from sheet stock is given. The blade described was used in the Jumo 004 turbojet engine and consists of a rhomboid-shaped base. The material from which the blades were made is a nickel-chromium composition soft-annealed steel with some manganese, titanium, silicon with traces of sulphur and lead, with a strength of from 43 to 50 T/in.^{2} Blades are brazed to the wheel disk with a newly-developed silver brazing agent at an oven temperature of from 1150° to 1170°C. A listing of tools, gages, and fixtures required for the production of 200 blades per hour is given. The description of the operations performed by each piece of equipment is also included.

Cincinnati Milling Machine Co., Ohio.
HIGH TEMPERATURE MACHINING METHODS. PHASE I. EVALUATION OF ELEVATED TEMPERATURE MACHINING METHODS, by William Pentland, Clarence L. Mehl and Jens L. Wennberg. Rept. no. 1, 5 Sep 59-5 Feb 60, on Contract AF 33(600)40066. [1960] 187p. 52 refs.
Order from OTS $3.00 PB 161 680

A history of hot machining is presented and the results of an industry survey indicate the problem areas in cutting high strength materials for which elevated temperature techniques should be developed. Orthogonal cutting and tool-life turning tests, face milling and drilling tests were carried out on four representative aircraft materials, heat treated to the 350-600 BHN hardness range and the results of these are analyzed. The materials used were AISI 4340, Thermold J, 17-4 MO and 17-7 PH. A discussion of the potential of various heating methods is made and descriptions are included of practical evaluations using flame, furnace, induction, and radio-frequency resistance heating techniques. Studies of heat distribution and flow within workpieces are described and hazards of the process evaluated.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
BIBLIOGRAPHY ON EXPLOSIVE METAL WORKING, by C. T. Olofson and F. W. Boulger. 7 Apr 60, 18p. 210 refs. DMIC memo. 51.
Order from OTS $0.50 PB 161 201

A considerable amount of effort has been and is being devoted to investigating the advantages and limitations of using explosive energy in metal-working operations. This bibliography was prepared in response to requests by groups considering experimental programs in this field.

Driver, Wilbur B., Co., Newark, N. J.
INDUSTRIAL PREPAREDNESS STUDY ON NON-NICKEL BEARING ALLOY BRAID WIRE, by William L. Stryker. Final rept. for 23 Aug 57-5 Sep 58 on Contract DA 36-039-sc-72780. [1958] 16p; AD 212 204.
Order from LC mi$2.40, ph$3.30 PB 145 703

Experimental forming of braid wire for cable from a nickel-free austenitic stainless steel containing 15.85% manganese, 14.02% chromium, 0.12% carbon, and 0.15% nitrogen.

General Electric Co., Utica, N. Y.
AUTOMATIC COMPONENT ASSEMBLY SYSTEM, by William R. Seigle. Final rept. on Contract DA 36-039-sc-70255. [1959] 130p. AD-216 617.
Order from LC mi$6.30, ph$19.80 PB 145 725

The automatic component assembly system (ACAS) demonstrated a way to use an incremental dimensioning system in electronic assembly hardware. The problem of programmed automation is no longer whether programmed electronic control is a valid concept, but whether to use tape or card programming. The principle of batch-sequential assembly operation introduced by the ACAS appears to be a major advance in production technology; it offers maximum machine utilization for either in-line or unitized machine systems. The actual implementation of a hardware program demonstrated the necessity for having incremental dimensioning standards on components as well as on the base, printed wiring or otherwise, upon which the components are to be mounted. A distinct advantage of mechanized assembly methods is the accurate and reliable electromechanical control of process parameters which is superior to manual control. The mechanized soldering technique employed by ACAS shows the quality and efficiency improvements made possible by mechanization. The appendixes contain a programming manual and the ACAS equipment design parameters.

Lockheed Aircraft Corp. [Burbank, Calif.]
HIGH ENERGY RATE METAL FORMING, by A. F. Watts and Glen N. Rardin. Interim technical rept. no. 8, for 1 Jan-31 Mar 60, on Contract AF 33(600)35543. [1960] 11p. LR 14408.
Order from LC mi$2.40, ph$3.30 PB 146 776

Tests were conducted previously on a two feet diameter water tank to establish procedures and materials most suitable for reducing the stresses in the walls of a tank during an explosive forming cycle. On the basis of these tests a full scale tank was designed and constructed. One feature of this tank is that the tank walls are not mechanically connected to the base. An aerator was included in the design based upon tests conducted previously.

North American Aviation, Inc., Downey, Calif.
PROPERTIES OF RESISTANCE SPOTWELD 24S-T3 AND 75S-T6 ALUMINUM ALLOY SHEET AND 17-7PH STAINLESS STEEL SHEET AT DEPRESSED AND ELEVATED TEMPERATURES, by E. J. Pelochino and J. R. Bellah. Rept. on Contract W33-038-ac-14191. 1 Feb 54, 143p. Rept. no. AL-1840; AD-29 182.
Order from LC mi$7.20, ph$22.80 PB 146 559

Design properties and test results at room, elevated and depressed temperatures of resistance spotwelded joints are presented. The major portion of the program was devoted to testing clad 24S-T3 and 75S-T6 aluminum alloy sheet and 17-7PH stainless steel in two conditions, THD (hardened and aged) and SA (stretched and aged). Bare 24S-T3, 75S-T6 and clad 61S-T6 aluminum alloy sheet was also tested. The results include spotweld shear, tensile, and combined shear and tensile strengths for various temperatures, exposure times and sheet thicknesses.

Stanford Research Inst., Menlo Park, Calif.
FEASIBILITY STUDY OF PLASMA WELDING OF REFRACTORY METALS. Progress rept. no. 2, 1 Sep-1 Nov 59, on Contract NOas-59-6234C. [1959] 2p. SRI Project SU-2927.
Order from LC mi$1.80, ph$1.80 PB 145 814

This study is concerned with the adaptation of the plasma jet to the welding of refractory metals such as Ta, Mo, Ti, Zr, and W. In order to adapt the plasma jet to welding, it is necessary to produce a jet of small diameter and to reduce the effects of high gas velocity in the jet.

Transport, Traction and Hoist Facilities

Army Transportation Research and Engineering Command, Fort Eustis, Va.
TUG HAWSER PULL STUDY, by Charles D. Roach. Sep 59, 18p. 1 ref. Research Technical memo. RTM 30; AD-230 923.
Order from LC mi$2.40, ph$3.30 PB 145 701

The calculations contained in this memorandum are designed to give a reasonably accurate estimate of the towrope pull of a normal single-screw tug at any speed within the usual towing speed range.

Computer Lab., Ordnance Tank-Automotive Command, Center Line, Mich.
DIGITAL COMPUTER PROGRAM FOR ACCELERATION PERFORMANCE, TRACKED VEHICLES, by Robert Arno. Rept. on Contract DA 20-089-ORD-39246. 25 Jan 60, 46p. Rept. no. RR-8.
Order from LC mi$3.30, ph$7.80 PB 146 761

A general computer program was written for the Electrodata 204 "Datatron" Digital Computer to calculate acceleration performance and related characteristics of tracked vehicles. Vehicle performance is determined at prescribed time intervals during acceleration from standstill to maximum velocity. Other additional data supplied by this program are vehicle speed, distance traveled, time of travel, sprocket torque, tractive effort, rolling resistance, drawbar pull, and acceleration. (Author)

Computer Lab., Ordnance Tank-Automotive Command, Center Line, Mich.
DIGITAL COMPUTER PROGRAM FOR WHEELED VEHICLE MOBILITY COMPUTATION, by Alexander Edwards. Rept. on Contract DA 20-089-ORD-39246. Jan 60, 78p. Rept. no. RR-7.
Order from LC mi$4.50, ph$12.30 PB 146 760

A general computer program was written for the Electrodata 204 Digital Computer to permit rapid solution of wheeled vehicle mobility performance. Curves of sinkage and drawbar pull versus mud and snow soil consistencies were plotted of various sized tires for preliminary design guidance. (Author)

MATERIALS

Bureau of Yards and Docks, Washington, D. C.
PRESERVATION, PACKAGING, AND PACKING OF "C" COGNIZANCE MATERIEL. Rev. 29 July 57, 73p. Technical pub. NAVDOCKS TP-PW-14; BUDOCKSINST 4030.1B.
Order from OTS $2.00 PB 161 539

This publication presents detailed instructions pertaining to the cleaning, preservation, packaging, marking, depreservation, and exercising of "C" Cognizance Materiel for (a) dead storage and (b) live storage. The processes specified herein are intended to render a functional service rather than to improve the appearance of materiel, and shall be so used.

Inland Testing Labs. [Morton Grove, Ill.]
UNIFORM DUPLICATION OF ENVIRONMENTAL TEST RESULTS. PART I. INFORMATION SURVEY, by Paul Gottfried, Chester G. Polak, and John McGee. Rept. on Contract AF 33(616)5413. Oct 58, 73p. 16 refs. WADC Technical rept. 58-613, Pt. I; AD-205 774.
Order from LC mi$4.50, ph$12.30 PB 146 574

The following is an account of work performed in the first of three phases on research to amplify and supplement certain detail in USAF specifications MIL-E-5272 and MIL-E-4970. This phase consisted of a literature survey, visits to industry and Government installations, and the development and distribution of a questionnaire. A tabulation of the responses to the questionnaire is also given and some of the recommendations are included. (Author)

Inland Testing Labs. [Morton Grove, Ill.]
UNIFORM DUPLICATION OF ENVIRONMENTAL TEST RESULTS. PART II. SURVEY ANALYSIS, by Paul Gottfried, Chester G. Polak, and John McGee. Rept. on Contract AF 33(616)5413. Nov 58, 52p. WADC Technical rept. 58-613, Pt. II;

AD-205 775.
Order from LC mi$3.60, ph$9.30 PB 146 573

The report contained herein is an analysis and evaluation of the information obtained during the research and investigation conducted in Part I of this program. The factual or statistical presentation of this information was included in the Part I Technical Report. This report will be concerned only with the information which applies directly to nonrepeatability or nonuniformity of the environmental tests, specifically the tests of humidity, high temperature, low temperature, temperature shock, and sand and dust as specified in specifications MIL-E-5272 and MIL-E-4970. The analysis includes recommendations designed to clarify each of the specified test procedures and to improve the repeatability of the tests in such a manner that the test may be duplicated in diverse testing installations. Appendix I of this report contains the recommended revisions for specification MIL-E-5272 employing the results of the literature analysis. Appendix II of this report contains a recommended detail equipment specification to be used in conjunction with revised specification MIL-E-5272. The purpose of the detail specification is to establish a comparative test program which will evaluate the effectiveness of the proposed specification revisions and recommendations. (Author) (See also PB 146 574)

Materials Lab., Wright Air Development [Div.]
Wright-Patterson AFB, Ohio.
CONFERENCE ON HIGH TEMPERATURE POLYMER AND FLUID SYNTHESIS, HELD IN DAYTON, OHIO, 23-24 OCTOBER 1957, by Calvin H. Schmid. Rept. on Rubber, Plastic, and Composite Materials. Jan 58, 221p. 18 refs. WADC Technical rept. 57-657; AD-142 285.
Order from OTS $3.50 PB 161 663

Contents:
Materials bottleneck
Principles of inorganic polymerization
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Coordination polymers
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Synthesis of polyxylylyldimethylsilane and polyxylylyldimethylsiloxane
High-temperature base stock fluids
Synthesis and evaluation of thermally stable fluids based on ferrocene
Chain type polyphenyls
Liquid ureas
High temperature stable semi-organic fluids

American Electro Metal Div., Firth Sterling, Inc., Yonkers, N. Y.
AN INVESTIGATION OF THE MECHANICAL PROPERTIES OF CERMETS AS RELATED TO THE MICROSTRUCTURE, by Ira Binder. Rept. for 15 May 58-1 June 59 on Ceramic and Cermet Materials, Contract AF 33(616)5084. Jan 60, 102p. 7 refs. WADC Technical rept. 58-432, Pt. 2.
Order from OTS $2.50 PB 161 656

TiC/Ni compositions with 10, 20, and 40 percent nickel were tested for transverse rupture strengths up to 1600°C. Transverse bend, cantilever beam, hot deformation, and hot extrusion experiments were performed in order to study the onset of plastic deformation. These materials were plastically deformed, and their microstructures were studied to learn about the mode of deformation. Plastic flow of the nickel binder and alignment of the carbide grains were discovered. Other refractory hardmetal compositions, both single-phase and cemented, were tested in transverse rupture up to 1600°C and were also subjected to various forms of hot deformation. Transverse strength peaks, versus temperature, were found for each material in the range 800 - 1300°C. Reasons for this behavior are developed. Microstructures of these materials were examined in connection with the strength tests and deformation studies. (Author) (See also PB 151 722)

Armour Research Foundation, Chicago, Ill.
THE MECHANICAL PROTECTION OF THE W/Ir THERMOCOUPLE, by Gary Steven and Walter C. Troy. Rept. no. 18, 16 June 49, 6p. NEPA 1059-ARM-18; AD-204 056.
Order from LC mi$1.80, ph$1.80 PB 138 320

The W/Ir thermocouple was subjected to a series of tests designed to determine its behavior under different atmospheric conditions. An order was placed for zirconia bricks and tubes to be used as components in a gas fired high temperature furnace. The construction of the molybdenum wound high temperature furnace for the NEPA division was temporarily set aside pending a decision as to the heating space requirements. (See also PB 137 033)

Clevite Research Center, Cleveland, Ohio.
STUDY OF AGING OF HIGH PIEZOELECTRIC COUPLING CERAMICS, by F. Kulcsar and R. Gerson. Final rept. for 15 Aug 56-15 Aug 57 on Contract DA 36-039-sc-72832. 27 Aug 57, 64p. 6 ref 6 refs. AD-158 008.
Order from LC mi$3.90, ph$10.80 PB 146 530

A systematic study of aging in electromechanical parameters of poled ferroelectric ceramics was undertaken. The modified lead titanate zirconate composition showed an aging rate of 0.13% decade up to 200 days after poling. The stability of the material

with respect to thermal variation needs to be improved. The samples treated by γ-irradiation showed exceptional stability during room temperature storage (10 to 200 days after irradiation). The average change in resonant frequency (4 samples) was well under 0.5%. The heat treatment yields a small but significant improvement in aging characteristics. A poling temperature close to 30° to 70°C resulted in an earlier flattening of the aging curve. Several lead titanate zirconate ceramics with additions of 3- and 5-valent element oxides all had low mechanical Q values. Similar compositions with all of the ZrO_2 replaced by HfO_2 showed poor shelf aging with respect to resonant frequency. Additions of Cr_2O_3 or V_3O_8 to lead titinate zirconate compositions produced stable ceramics with mechanical Q's from 300 to 400 and good resonant frequency stabilities in the case of Cr_2O_3. Best results were obtained with a 0.70- to 0.75-wt % addition. A preliminary prestabilizing treatment (10 successive quenchings from oil at 250°C into oil at 25°C) is desirable after poling in order to minimize temperature hysteresis effects. The source of the ZrO_2 appeared to be an important performance factor.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE DETERMINATION OF OXYGEN, NITROGEN, HYDROGEN, AND CARBON IN MOLYBDENUM, TUNGSTEN, COLUMBIUM, AND TANTALUM, by Manley W. Mallett. 31 Mar 60, 21p. 34 refs. DMIC memo. 49.
Order from OTS $0.50 PB 161 199

Oxygen: neutron activation, fluorination, other halogenation, fractography, mass spectrometry, solid mass spectrometry, isotopic dilution, emission spectrometry, vacuum fusion, inert-gas fusion, molybdenum, tungsten, columbium (niobium), tantalum; Hydrogen; Nitrogen: solution-distillation method, alkali fusion method, other methods; Carbon: gravimetric procedure, gasometric procedure, conductometric procedure.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
DIFFUSION RATES AND SOLUBILITIES OF INTERSTITIALS IN REFRACTORY METALS, by W. D. Klopp and Vincent D. Barth. 4 Apr 60, 13p. 45 refs. DMIC memo. 50.
Order from OTS $0.50 PB 161 200

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
PHYSICAL AND MECHANICAL PROPERTIES OF COLUMBIUM AND COLUMBIUM-BASE ALLOYS, by E. S. Bartlett and J. A. Houck. Rept. on Contract AF 18(600)1375. 22 Feb 60, 66p. 69 refs. DMIC rept. 125.
Order from OTS $1.75 PB 151 082

The current state of knowledge of the physical and mechanical properties of columbium and its alloy is reviewed. Columbium has good potential as an alloying base because of its low neutron-capture cross section (reactor applications) and high melting point, and related potential high-temperature strength (air- and space-vehicles structural applications). Pure columbium is soft and ductile and does not possess good strength at temperatures above 1600 F. Elevated-temperature strengthening is accomplished by solid-solution-strengthening (with tungsten or molybdenum) and dispersion-hardening (zirconium plus carbon) mechanisms. The effects of singular and combined alloying additions on fabricability and low- and high-temperature strength are discussed. The properties of current commercial and advanced laboratory alloys are correlated with strengthening mechanisms. A Cb-15W-5Mo-1Zr-0.05C-0.05 O alloy, with 100 hour, 2200 F rupture stress of 17,000 psi, is the most promising alloy to be developed to date. (Author)

Emhart Mfg. Co., Hartford, Conn.
INVESTIGATION OF FLAKE LAMINATE, by E. K. Lane, Jr. Final rept. for 23 Aug 54-30 Jan 58 on Contracts DAI-28-017-501-ORD(P)-1490 and DAI-19-059-501-ORD(P)-2302. [1958] 65p. AD-202 831.
Order from OTS $1.75 PB 161 679

Development of a method of producing a glass flake laminate. Methods investigated included trying to make glass flake by: Rolling Glass Beads, Rolling Glass Tape, Blowing Extruded Ribbon, Drawing Tape from a Lip, Drawing Tape from a Slot, Stretching Film by Diverging Wires, Stretching Glass Film by Rims Having Parallel Axes, and Stretching Glass Film by Rims Having Inclined Axes. Of all these methods, the apparatus which stretched glass film on rims having inclined axes proved to the most successful. Experimental work points to production of a continuous ribbon of glass film as a possibility.

National Bureau of Standards, Washington, D. C.
BASIC STUDY OF PARTICLE-IMPACT PROCESSES FOR APPLYING CERAMIC AND CERMET COATINGS. PHASE 1. VELOCITY MEASUREMENTS OF FLAME-SPRAYED ALUMINUM OXIDE PARTICLES, by Dwight G. Moore, Warren D. Hayes, Jr. and Alfred W. Crigler. Rept. on Surface and Interface Phenomena of Matter, Contract AF 33(616)58-19. Oct 59, 22p. 8 refs. WADC Technical rept. 59-658, Pt. 1.
Order from OTS $0.75 PB 161 685

The velocities of flame-sprayed particles of aluminum oxide from both a rod-type and powder-type oxy-acetylene gun were determined with (1) a high-speed cinecamera, (2) a streak camera, and (3) a rotating disc velocimeter. An analysis of the measurements indicated that each of the three methods had potential weaknesses. In the two photographic methods, the film was exposed by the radiant energy emitted by the particles themselves; the results of these measurements were such as to suggest that the smaller (and presumably faster) particles were not being recorded on the film. The rotating-disc velocimeter method was based on measuring the displacement of the pattern of sprayed particles on a rotating disc caused by a "shadow bar" attached to the disc at a fixed distance toward the spray gun. This method gave an average velocity for only the adhering particles. The average velocities obtained with the rotating-disc velocimeter

varied with distance from the gun nozzle. The peak velocity for the rod gun was 566 ft./sec.; for the powder gun, 145 ft./sec. (Author)

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
MAGNESIA, by M. A. Schwartz. Feb 48, 121p. 103 refs. NEPA 463 IHR-E14.
Order from LC mi$6.30, ph$19.80 PB 146 223

Magnesia and its compounds such as spinel, forsterite, etc. have gained prominence in recent years as important super-refractory materials. The increased number of companies producing magnesia has resulted in making it more available in greater purity and at lower cost. An important development in this respect has been its extraction from sea-water. Improved methods of electric sintering and fusing of the material has also assisted in producing an improved product; and this material, by itself and in combination with other materials will undoubtedly offer increasing inducements for high temperature research. In reporting on the property data of magnesia, conflicting results are very evident, which is due mainly to the various grades of magnesia tested. Wherever possible, descriptions of the samples used in conducting tests will be included.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
THORIA, by M. A. Schwartz. Dec 48, 43p. 30 refs. NEPA 875 EMR-42 (Supersedes sections on Thoria in NEPA 309-IHR-14).
Order from LC mi$3.30, ph$7.80 PB 146 222

Fuels, Lubricants, and Hydraulic Fluids

Hefco Labs., Inc. Detroit, Mich.
THE CHEMICAL STABILIZATION OF NITROMETHANE AND TETRANITROMETHANE FOR USE IN MONOFUEL COMBINATIONS. Technical rept. for Dec 48-May 49 on Rocket Fuels, Contract N7onr-473, T. O. 1. May 49, declassified 16 Aug 55. 77p. 5 refs. ATI-58097.
Order from LC mi$4.50, ph$12.30 PB 146 519

Progress made in the investigation of the chemical stabilization of nitromethane and intranitromethane for use in monofuel combinations is reported. Relatively less work has been done on new fuel than on refinements of the testing techniques and the development of new testing methods. The techniques and methods discussed are mechanical and explosive impact testing, sand bomb testing, thermal stability testing, and thermal testing. A new thermal testing apparatus has been designed with which it is hoped that direct measurements of the temperature and pressure of fuels during the course of reaction can be obtained. The apparatus consists essentially of a test cavity closed by a thin membrane and a hardened steel cap.

Hefco Labs., Inc., Detroit, Mich.
THE CHEMICAL STABILIZATION OF NITRO METHANE AND TETRANITROMETHANE FOR USE IN MONOFUEL COMBINATIONS. Technical rept. for June 49-Feb 50 on Rocket Fuels, Contract N7onr-473, T. O. 1. [1950] declassified 16 Aug 55, 70p. 4 refs. ATI-77 605.
Order from LC mi$3.90, ph$10.80 PB 146 288

Progress made in the study of the chemical stabilization of nitromethane and tetraitromethane for use in rocket propellants is reported. A large part of the time was spent in an examination of the purity of the two components of the system, a study of methods of measuring and improving the purity, and of the determination of the purified materials. A study was made of the phase diagram of the nitromethane-tetranitromethane system. Previous work on the analysis of the combustion gases has been re-examined and improvements have been made in the analytical procedure. Work was also accomplished on inhibitors for the detonation of mixtures of nitromethane and tetranitromethane by explosive impact and on the explosive impact sensitivity of mixtures. Preliminary tests have been made with the new thermal stability apparatus. (Author)

Naval Boiler and Turbine Lab., Philadelphia, Pa.
EVALUATION OF H_2O WASHING TECHNIQUES FOR NAVY SPECIAL FUEL OILS, by H. M. Foltes. Evaluation rept. 2 Mar 59, 14p. NBTL Test P-336; AD-214 345.
Order from LC mi$2.40, ph$3.30 PB 145 823

Water washing of fuel oils reduces the sodium content to a great extent but has only a small effect on the removal of organic vanadium compounds present in fuel oils. Mono and dibasic ammonium phosphates, employed as water washing agents, resulted in lower ash contents than do magnesium or calcium salts.

Naval Ordnance Test Station, China Lake, Calif.
OPTIMUM PROPORTIONING OF TWO PROPELLANTS TO OBTAIN MAXIMUM BURNT VELOCITY, by R. H. Olds. 7 Apr 58. 65p. 5 refs. NOTS 2002; NAVORD rept. 5873; AD-163 092.
Order from LC mi$3.90, ph$10.80 PB 145 910

Using burnt velocity as a measure of performance, it is shown that better performance may be obtained from combinations of two propellants than can be obtained from either propellant alone. The improved performance depends upon the relative densities of the two propellants as well as upon their energies. Optimum performance results from a suitably programmed variation of propellant proportions throughout burning. The present work confirms an earlier effort by Lorell and Hibbs of the Jet Propulsion Laboratory and extends the analysis to some cases not previously considered. (Author)

Phillips Petroleum Co., Bartlesville, Okla.
GAS TURBINE AND JET ENGINE FUELS, by George D. Kittredge. Summary rept. for 1 July 57-30 June 58 on Contract NOas-58-310-d. 22 Sep 58, 79p. 10 refs. Research Div. rept. 2182-58R;

AD-205 981.
Order from LC mi$4.50, ph$12.30 PB 146 632

Completion of the 96 week storage stability program discussed in earlier contract reports has confirmed preliminary findings that no serious deterioration has taken place with the JP-5 specification test fuels during this term of ambient temperature storage, in terms of either existent gum content or CFR Fuel Coker ratings. Hot room storage at 110 F (indicated to be roughly four times as severe as ambient storage) did cause JP-5 fuels from West Coast and Gulf Coast sources to go "off spec" in terms of gum content after 48 weeks time. Two-inch combustor testwork at moderate-to-high pressure levels has established a relationship between radiant heat flux across the flame zone and metal temperatures. Flame tube metal burn-off rates also agreed reasonably well with transverse radiation intensity and flame tube temperature. Fuel type was shown to influence radiant heating of the combustor liner in the following order of decreasing severity -- aromatics, naphthenes and paraffins, followed by an alcohol.

Rock Island Arsenal Lab., Ill.
INVESTIGATION OF RESIN SYSTEMS AS BONDING AGENTS FOR DRY LUBRICANTS, by F. S. Meade and G. P. Murphy. 4 June 59, 32p. 8 refs. Rept. no. 59-1515; AD-217 315.
Order from LC mi$3.00, ph$6.30 PB 146 485

Eighteen resin systems were pigmented with micro-size molybdenum disulfied in four pigment-to-resin ratios: 0:1, 1:1, 3:1, and 9:1, to obtain dry lubricant formulations. The lubricating properties of the cured dry lubricant formulations were evaluated by means of a Shell Four-Ball Wear Tester, Shell Four-Ball Extreme Pressure Tester, Falex Lubricant Test, and Cincinnati Stick-Slip Tester. The dry lubricant formulations were also examined for storage stability after at least 12 months storage at room temperature. The molybdenum disulfide resin bonded dry lubricants were statistically ranked as to their over-all lubricating effectiveness. Dry lubricant formulations incorporating the same type of resins supplied by different sources were not necessarily ranked the same. The most effective pigment-to-resin ration was 9:1 and the most effective resin systems at this pigment-to-resin ratio, taking into consideration both lubricative properties and storage stability, were epoxy-phenolic and epoxy-polyamide resin systems. (Author)

Leather and Textiles

Fabric Research Labs., Inc., Dedham, Mass.
SOME ASPECTS OF BENDING RIGIDITY OF SINGLES YARNS, by Milton M. Platt, William G. Klein, and Walter J. Hamburger. Technical rept. no. 7 on Contract Nonr-1422(00). 15 Mar 59, 59p. 11 refs.
Order from LC mi$3.60, ph$9.30 PB 145 927

Theoretical analyses are given of the effects of fiber properties and yarn structure on singles yarn bending rigidity. The two extreme cases of (a) complete freedom and (b) no freedom of relative fiber motion are analyzed. The effects on yarn rigidity of fiber dimensions, fiber stiffness, torsional to bending rigidity ratio, yarn density, size, and twist, fiber clustering, and prior relaxation treatments are analytically investigated. (See also PB 143 610)

Materials Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
EVALUATION OF NYLON "6" CORDS, RIBBON AND TAPES, by C. F. Holmes, Jr. Rept. for June 54-June 58 on Air Force Textile Materials. Jan 59, 14p. WADC Technical note 59-14.
Order from LC mi$2.40, ph$3.30 PB 146 278

The purpose of this evaluation was to determine if materials made from nylon "6" are suitable substitutes for materials made from nylon "66". This was accomplished by manufacturing certain tapes, ribbons, cords and threads in accordance with the construction requirements of appropriate specifications except that nylon "6" was used in the place of nylon "66". The materials were then tested to determine if they met the physical requirements of the specifications. It was found that some of the materials did not meet some of the breaking strength and elongation requirements of the appropriate specification. Materials made from nylon "6" can not, therefore, be used indiscriminately in the place of nylon "66" materials. (Author)

Quartermaster Research and Engineering Center, Natick, Mass.
DEVELOPMENT OF SHADE STANDARD AND TOLERANCES FOR USAF BLUE 85 SERVICE OVERCOAT, by Frank J. Rizzo, Constantine J. Megas, and others. Rept. for 23 Sep 53-19 Dec 58 on Air Force Textile Materials, Contract AF 33(616)53-221. Jan 60, 67p. 11 refs. WADC Technical rept. 59-397.
Order from OTS $1.75 PB 161 684

The work involved development of a formulation of high order colorfastness properties, for Air Force Service Overcoat, practical for the Industry to apply routinely, and application of such formulation to the preparation of a new shade standard and a practical range of color tolerances. The resultant studies here reported have fulfilled the stated requirements. The formulation is colorfast; the tolerance range is of a degree of spacing permissible in end use without apparent inconvenience to the Industry in attainment. Colorfastness of the tolerance range relative to standard is such that uniformity in appearance throughout the useful life of the garment seems reasonably assured.

Plastics

Army Prosthetics Research Lab., Washington, D.C.
DILAMINAR COSMETIC GLOVES, by Allen Winer. 6 Mar 59, 8p. 1 ref. Technical rept. no. 5915; AD-212 658.
Order from LC mi$1.80, ph$1.80 PB 146 214

A latex dipping method has been developed to produce abrasion resistant cosmetic gloves by using a dilaminar approach. This new method apparently eliminates

the serious problem of poor resistance to abrasion and tack development which has thus far retarded the use of this laboratory's standard terpolymer latex for cosmetic gloves.

Army Prosthetics Research Lab., Washington, D. C.
REVISED SUNLAMP EXPOSURE TEST FOR VINYL FILMS, by James T. Hill. Sep 58, 6p. Technical rept. no. 5824; AD-203 928.
Order from LC mi$1.80, ph$1.80 PB 146 854

A method used to accelerate the aging of vinyl materials consists of exposing the test specimens for 3 weeks to a sunlamp and measuring the color changes that occur in these specimens. In order to duplicate sunlamp exposure tests it is necessary to expose the samples to the same amount of radiant energy. In order to increase the precision of duplication it is necessary to continuously measure the energy from these lamps and thus expose the samples to equal amounts of radiation. For this reason an investigation was conducted to develop a method of measuring U. V. energy.

Midwest Research Inst., Kansas City, Mo.
FABRICATION AND DEVELOPMENT OF COMPOSITE PLASTIC PLATES. Final rept., Phase 2, 16 July 58-14 Apr 59, on Contract NOas 58-563-c. 6 Jan 60, 45p. 17 refs. AD-232 235.
Order from LC mi$3.30, ph$7.80 PB 145 904

Transparent thermosetting plastics were used in making composite aircraft glazing materials. These plastics were cast in situ on "hot stretched" acrylic sheet. It will provide an insulating layer to protect the acrylic from the high skin temperatures encountered on supersonic aircraft. This program consists of two parts. Phase I, completed in August, 1958, was the fabrication of a composite material from hot stretched acrylic and an allyl resin. Phase II is discussed in this report. The diglycidyl ether of bisphenol A, an epoxy resin, was crosslinked with hexahydrophthalic anhydride using benzyltrimethylammonium chloride as a catalyst and triphenyl phosphite as an antioxidant. This system was cast onto a curved section of hot stretched acrylic. The resultant composite was nearly water-white and very transparent. (See also PB 144 890)

Naval Ordnance Lab., White Oak, Md.
DIFFERENTIAL THERMAL ANALYSIS OF POLYMERIC MATERIALS, by Hugh C. Anderson. 18 Feb 59, 29p. 11 refs. NAVORD rept. 6210; AD-218 198.
Order from OTS $0.75 PB 161 676

The assembly and operation of a differential thermal analyzer is described. Its versatility, order of precision and accuracy is demonstrated. The analyzer is shown to be an important tool in studying the thermal processes which take place when a polymeric material is pyrolyzed. (Author)

Naval Ordnance Lab., White Oak, Md.
A NEW METHOD FOR DETERMINING THE SECOND ORDER TRANSITION IN POLYMERS, by R. W. Warfield. 10 Mar 59, 17p. 18 refs. NAVORD rept. 6285.
Order from LC mi$2.40, ph$3.30 PB 145 819

A new method is described for determining the second order transition in polymers. The method is based upon an analysis of the temperature dependence of electrical resistivity. When resistivity is plotted vs. temperature, a change in slope occurs at the transition point. Results obtained by this method have been shown to agree closely with independent specific heat determinations and with published values. The nature of the second order transition in polymers is discussed. (Author)

Naval Ordnance Lab., White Oak, Md.
THE SPECIFIC HEAT OF THERMOSETTING POLYMERS, by R. W. Warfield, M. C. Petree and P. Donovan. 14 Jan 59, 21p. 19 refs. NAVORD rept. 6255; AD-216 802.
Order from LC mi$2.70, ph$4.80 PB 145 822

Specific heat, as a function of temperature has been determined over the range of 30°C to 160°C for a number of thermosetting polymers. The data were obtained by means of an adiabatic calorimeter. In agreement with theory, the specific heats of the polymers showed a progressive increase with increasing temperature. In many cases large increases in specific heat have been observed which are indicative of second order transitions within the polymer. (Author)

Naval Ordnance Lab., White Oak, Md.
A STUDY OF THE POLYMERIZATION OF THERMOSETTING POLYMERS BY ELECTRICAL RESISTIVITY TECHNIQUES, by R. W. Warfield and M. C. Petree. 5 Aug 59, 22p. 20 refs. NAVORD rept. 6702.
Order from LC mi$2.70, ph$4.80 PB 145 821

Electrical volume resistivity measurements made isothermally during polymerization have been used to study the bulk polymerization of epoxide, polyester and polyurethane polymers. Whenever possible, kinetic parameters have been calculated. The existenc of micelles in the solid polymer is postulated as exp aining the observed differences in the E_c values for these crosslinked polymers. The results of this study indicate that electrical resistivity measurements are sensitive to the rate and extent of polymerization and appear to be useful in studying the structure of the solid polymer.

Rubber and Elastomers

Institute of Rubber Research, U. of Akron, Ohio.
STRESS RELAXATION AND STRUCTURE OF HIGH TEMPERATURE ELASTOMERS, by Maurice Morton, V. R. Allen, and R. D. Gates. Technical rept. no. 4 for 1 Mar-31 May 59 on Contract Nonr-2573(00). [1959] 26p. 12 refs.
Order from LC mi$2.70, ph$4.80 PB 146 230

Natural rubber vulcanizates, having different types of crosslinks, have been found to have very similar sol versus degradation relations. Based on this and other factors, it is proposed that the degradation reaction for these vulcanizates is primarily a random chain scission process. Also, in order to explain the difference between the theoretical relation and the experimental results, it is proposed that this scission of chemical bonds is accompanied by the simultaneous release of chain entanglements ("physical" crosslinks). This, therefore, results in a concurrent crosslink destruction and random chain scission.
(See also PB 144 960)

Rock Island Arsenal Lab., Ill.
HIGH TEMPERATURE PROPERTIES OF ELASTOMER VULCANIZATES, by E. W. Bergstrom.
21 Jan 60, 47p. 2 refs. Technical rept. no. 60-188.
Order from OTS $1.25 PB 161 689

The high temperature capabilities and limitations of vulcanizates prepared from many of the currently available elastomers were determined. The physical properties of vulcanizates were measured both after aging and at various high temperatures. The vulcanizates were then rated as to heat resistance on the basis of retention of tensile strength. Results of a great many tests and formulations are presented.

Rock Island Arsenal Lab., Ill.
ORGANO METALLIC SOAPS AND POLYHYDRIC COMPOUNDS AS HEAT STABLE INHIBITORS FOR SBR VULCANIZATES, by Frank B. Testroet.
29 Dec 59, 17p. 4 refs. Rept. no. 59-3249; AD-233 082L.
Order from OTS $0.50 PB 161 678

Organo metallic soaps and polyhydric compounds, separately and in combination with each other, were evaluated to determine the capacity of these materials for protecting SBR vulcanizates from the deleterious effect of heat aging. Although these materials have little value as heat stable inhibitors when used separately, it appears that when combined, a synergistic effect is obtained which leads to protection of the vulcanizates during heat aging.

MATHEMATICS

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON THE ADJOINT SEMIGROUP AND SOME PROBLEMS IN THE THEORY OF APPROXIMATION, by Karel De Leeuw. Technical note no. 3 on Contract AF 49(638)294. 13 Apr 59, 36p. 8 refs. AFOSR-TN-59-214; AD-211 776.
Order from LC mi$3.00, ph$6.30 PB 145 742

Results of P. L. Butzer concerning the identification of saturation classes arising in the theory of approximation are extended to non-reflexive Banach spaces by the consideration of adjoint semigroups. (Author)

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON TIME SERIES ANALYSIS AND REPRODUCING KERNEL SPACES, by N. Donald Ylvisaker. Technical rept. no. 1 on Contract DA 04-200-ORD-996.
4 Nov 59, 43p. 10 refs; AD-229-913.
Order from LC mi$3.30, ph$7.80 PB 145 715

The representation of a second order process by a reproducing kernel space is here taken on the real line. Section 2 is devoted to some aspects of the general theory of reproducing kernel spaces and to the particular case in which K is a kernel on E_2 of the form $K(s,t) = k(s-t)$.

California U., Berkeley.
DISTRIBUTIONS AND GENERAL THEORY OF DIFFERENTIAL OPERATORS, by François Trèves. Technical rept. no. 1 on Contract AF 49(638)604.
Jan 60, 134p. 4 refs. AFOSR-TN-60-34.
Order from LC mi$6.90, ph$21.30 PB 146 082

These notes correspond to a series of lectures given at the University of California in Berkeley during the term of Fall 1959. The purpose of those lectures was to introduce students to the techniques of topological linear spaces and Schwartz's distributions in the field of linear partial differential equations. Actually only a few topics are studied and the lectures are essentially concerned with the case of constant coefficients, more precisely with the general theory, that is to say with the properties independent from type. These notes do not contain any new result; they are essentially excerpts from works by L. Hörmander, B. Malgrange and L. Schwartz.

Cornell U., Ithaca, N. Y.
ON A SERIES OF COSECANTS II, by Harry Kesten. Rept. on Contract Nonr-401(03). [1959] 18p.
6 refs. AD-213 329.
Order from LC mi$2.40, ph$3.30 PB 145 995

Florida State U., Tallahassee.
OPENNESS OF THE DERIVATIVE OF A COMPLEX FUNCTION, by Robert L. Plunkett. Rept. on Contract AF 49(638)598. Sep 59, 9p. 3 refs. AFOSR-TN-59-1120.
Order from LC mi$1.80, ph$1.80 PB 145 769

The principal object of this paper is to present a purely topological proof of the strong openness of the derivative of a complex function. This openness is, of course, a direct consequence of the existence of the second derivative, but the proof of that existence still requires the use of powerful techniques of function theory which depend on complex integration. The proof presented here is therefore necessarily independent of the existence of the second derivative.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
A DERIVATION OF THE BASIC EQUATIONS FOR HYDRODYNAMIC LUBRICATION WITH A FLUID HAVING CONSTANT PROPERTIES, by Harold G. Elrod. Interim rept. on Contract Nonr-2342(00).

Apr 59, 21p. 2 refs. Rept. no. I-A2049-5.
Order from LC mi$2.70, ph$4.80 PB 145 943

In this report small parameter techniques are used to derive Reynolds' lubrication equations, and refinements thereof, from the full Navier-Stokes equation, for fluids having constant properties. An effort has been made to retain vigor in the development comparable to that used in present-day boundary-layer developments. Analytical techniques similar to those employed here have been adapted to the derivation of equations applicable to fluids having pressure and temperature-dependent properties, such as gases. The results will be presented in a subsequent report.

Institute for Advanced Study, Princeton, N. J.
INTRINSIC OPERATORS IN THREE-SPACE, by Victor L. Shapiro. Rept. on Contract AF 49(638)253. May 59, 17p. 9 refs. AFOSR-TN-59-499; AD-215 924.
Order from LC mi$2.40, ph$3.30 PB 146 213

The following theorem is proved: Let D be a domain in Euclidean 3-space and let v be a continuous vector field defined in D. Then a necessary and sufficient condition that v be locally in D the gradient of a potential of a distribution with continuous density, is that the intrinsic curl of v be zero in D and the intrinsic divergence of v be continuous in D.

Institute of Mathematical Sciences, New York U., N. Y.
ON THE DIRICHLET PROBLEM FOR THE REDUCED WAVE EQUATION, by Rolf Leis. Rept. on Contract AF 49(638)229. June 59, 25p. 12 refs. Research rept. no. BR-30; AFOSR-TN-59-945.
Order from LC mi$2.70, ph$4.80 PB 145 743

In this paper, an existence theorem for the exterior Dirichlet problem for the reduced wave equation will be given for piecewise smooth surfaces. (Author)

Johns Hopkins U., Baltimore, Md.
ON LOCAL AND GLOBAL PROPERTIES OF CONVEX SETS AND HYPERSURFACES, by Richard Sacksteder. Doctoral thesis. Technical note no. 14 on Contract AF 18(603)41. Nov 59, 47p. 28 refs. AFOSR-TN-59-1294.
Order from LC mi$3.30, ph$7.80 PB 145 774

In the first chapters, there is obtained a generalization of a theorem of Tietze characterizing convex sets by local properties. This result is used in the second chapter to prove the main result: Let S be a (sufficiently smooth) isometric immersion of a complete n-dimensional Riemannian manifold M^n in a Euclidean space E^{n+1} with the intrinsic property that the second fundamental form of S is semi-definite at every point and definite at some point. Then S is the boundary of a convex body (although if M^n is not complete, S need not even be locally convex). The third chapter deals with a number of topics. Examples are given to show that theorems of Hilbert and Weyl, concerning extrema of principle curvatures or of mean and Gauss curvatures at non-umbilic points, are false without suitable smoothness assumptions. (Author)

Leyden U. (Netherlands).
RELATIONS BETWEEN PATH INTEGRALS AND THE VARIATIONAL PRINCIPLES OF HAMILTON, by J. Vlieger, P. Mazur, and S. R. de Groot. Technical note on Contract AF 61(052)16. 16 July 59, 9p. 7 refs. AFOSR-TN-59-959; AD-226 407.
Order from LC mi$1.80, ph$1.80 PB 146 019

Groenewold's representation (Kgl. Danske Videnskab. Selskab mat. -fsy. Medd. 30:1956) for the propagation of the Schrödinger equation is shown to lead to the so-called modified Hamilton Principle. (Author)

Liège U. (Belgium).
PROBLEMS AND METHODS IN PARTIAL DIFFERENTIAL EQUATIONS. PART III: DIFFERENTIATION OF THE FINITE PART AND OF THE LOGARITHMIC PART OF SOME DIVERGENT INTEGRALS WITH APPLICATIONS TO THE CAUCHY PROBLEM, by F. J. Bureau. Technical (scientific) note no. 1 on Contract AF 61(052)86. Oct 59, 92p. 28 refs. AFOSR-TN-59-963.
Order from LC mi$5.40, ph$15.30 PB 145 744

This report represents a part of a group of lectures given at Duke University during the academic year 1955-56. It introduces the theory of the finite part and the logarithmic part of some divergent integrals and applies it to the study of the Cauchy problem for the wave equation, the damped wave equation and the singular equation of Euler-Poisson-Darboux.

Mathematics Research Center, U. of Wisconsin, Madison.
THE LOCATION OF THE ZERO OF INFRAPOLYNOMIALS, by Morris Marden. Rept. on Contract DA 11-022-ORD-2059. Nov 58, 23p. 18 refs. MRC Technical summary rept. no. 55; AD-209 996.
Order from LC mi$2.70, ph$4.80 PB 146 021

See also PB 128 618

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
AN APPLICATION OF THE POTENTIAL ANALOGY TO SOLVING HURWITZ POLYNOMIAL EQUATIONS, by Henry G. Ansell. Rept. on Contract AF 30(602)1709. 24 Sep 58, 34p. 11 refs. Research rept. R-686-58; PIB-614; RADC-TN-58-391; AD-148 889.
Order from LC mi$3.00, ph$6.30 PB 146 179

A method of locating the zeros of Hurwitz polynomials with the aid of a conducting sheet is presented. The technique is a compromise between purely computational solution, and solution by digital computer, in that the purely computational work is greatly simplified, and the analogue technique used is simple to set

up and operate. Computationally, the proposed method requires solving polynomial equations of reduced order having only real, positive roots. For example, determining by this method the zeros of a quartic Hurwitz polynomial merely requires factoring quadratics for real roots. The equipment used consists essentially of a uniform-resistivity sheet, a power source supplying electrodes with direct current, and a d.c. null voltage detector (e.g., a vacuum tube voltmeter). The method requires detecting null voltages on the surface of the conducting sheet. The basis of the method is explained, and illustrative examples given. (Author)

Mathematics Research Center, U. of Wisconsin, Madison.
FUNCTIONS OF RESTRICTED VARIATION, by Preston C. Hammer and John C. Holladay. Rept. on Contract DA 11-022-ORD-2059. Nov 58, 23p. 15 refs. MRC Technical Summary rept. no. 58; AD-207 994.
Order from LC mi$2.70, ph$4.80 PB 146 257

For real-valued functions defined on a simply ordered set, we introduce the concept of the k-variations which result from limiting the number of points in a partition to k . These k-variations exist finitely for bounded functions. If for a given function the sequence of differences between (k + 1)-variations and k-variations has the limit zero as k increases we say the function is of restricted variation. In this paper various properties of functions of restricted variation are derived. It is shown that there exists an extension of the simply ordered set S to a simply ordered compact set S^* such that every function f of restricted variation on S may be extended to a function f^* continuous on S^* and conversely.

Mathematics Research Center, U. of Wisconsin, Madison.
OPTIMAL APPROXIMATIONS AND ERROR BOUNDS, by Michael Golomb and H. F. Weinberger. Rept. on Contract DA 11-022-ORD-2059. Oct 58, 75p. 29 refs. MRC Technical Summary rept. no. 49; AD-208 052.
Order from LC mi$4.50, ph$12.30 PB 146 256

Most known error estimates for approximation processes assign one, or at most a few different expressions for the error, to any particular process. It is a matter of luck whether or not the computer has available the information about the unknown function required by the particular expression and whether or not the error bound based on this expression uses all the information he does have. One may make the general statement that the more refined an approximation process is, the higher are the derivatives of the unknown function occurring in the error term, and hence the more likely it is that their magnitude is unknown. The purpose of the present paper is to free the numerical analyst from "the slings and arrows of outrageous fortune" by supplying him with the means of estimating errors in terms of what he knows. The general problem studied is: how to derive from a given amount of information about the unknown function u the total range of possible values of the functional F(u).

Minnesota U., Minneapolis.
POLYNOMINALS DEFINED BY A DIFFERENCE SYSTEM, by Glen Baxter. Technical rept. no. 11 on Contract AF 18(603)30. 15 Oct 59, 77p. 6 refs. AFOSR-TN-60-93.
Order from LC mi$4.50, ph$12.30 PB 145 761

A study is made of the polynomials $u_n(t)$ and $v_n(t)$ which are defined by the difference system

$$\begin{cases} \Delta u_n = \alpha_n e^{int} v_n \\ \Delta v_n = \beta_n e^{-int} u_n , \end{cases}$$

where α_n and β_n are presumed known. A relation between u_n and v_n and orthogonal polynomials as defined by Szegö is also considered. Application is made of the results to the problem of determining the distribution of max $(S_0, \ldots, S_n)$ and min $(S_0, \ldots, S_n)$ for the partial sums S_n of a sequence of independent, identically distributed random variables. (Author)

North Carolina U., Chapel Hill.
EVALUATION OF DETERMINANTS, CHARACTERISTIC EQUATIONS AND THEIR ROOTS FOR A CLASS OF PATTERNED MATRICES, by S. N. Roy, B. G. Greenberg and A. E. Sarhan. Technical rept. no. 10 on Estimation of Parameters by Order Statistics, Contracts DA 36-034-ORD-2184 and AF 49(638)213. 22 Dec 59, 28p. 5 refs. AFOSR-TN-60-200; OOR rept. 1597, 14-M.
Order from LC mi$2.70, ph$4.80 PB 145 994

Northwestern Technological Inst., Evanston, Ill.
MIXING ROUTINES FOR A CLASS OF COUPLED MODELS, by A. Charnes and W. W. Cooper (Carnegie Inst. of Tech.) ONR Research memo. no. 18 on Temporal Planning and Management Decision under Risk and Uncertainty, Contract Nonr-1228(10) and Planning and Control of Industrial Operations, Contract Nonr-760(01). May 59, 11p. 11 refs. AD-220 606.
Order from LC mi$2.40, ph$3.30 PB 145 976

Princeton U., N. J.
ALGEBRAS OF HOLOMORPHIC FUNCTIONS ON ONE-DIMENSIONAL VARIETIES, by Hugo Rossi. Rept. on Contract AF 49(638)692. Oct 59, 38p. 12 refs. AFOSR-TN-59-1179.
Order from LC mi$3.00, ph$6.30 PB 145 771

This note studies one-dimensional analytic spaces with emphasis on the maximality problem of the algebra of holomorphic functions on a compact subset, first considered for Riemann surfaces by John Wermer. It is proven that this is the only case where such an algebra is maximal. Representations of subalgebras of holomorphic functions on Riemann surfaces as algebras on an analytic is also considered. (Author)

Purdue U. [Lafayette, Ind.]
NORMAL OPERATORS ON THE BANACH SPACE $L^p(-\infty, \infty)$ I. BOUNDED OPERATORS, by G. L. Krabbe. Technical note no. 2 on Contract AF 49(638)505. 10 Nov 59, 5p. 5 refs. AFOSR-TN-59-579; AD-217 026.
Order from LC mi$1.80, ph$1.80 PB 146 006

Purdue U., Lafayette, Ind.
NORMAL OPERATORS ON THE BANACH SPACE $L^p(-\infty, \infty)$. PART II. UNBOUNDED OPERATORS, by G. L. Krabbe. Rept. on Contract AF 49(638)505. 20 Nov 59, 37p. 16 refs. AFOSR-TN-59-1212.
Order from LC mi$3.00, ph$6.30 PB 145 933

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
THEORY AND APPLICATION OF THE SEPARABLE CLASS OF RANDOM PROCESSES, by Albert H. Nuttall. Doctoral thesis. Rept. on Contract DA 36-039-sc-64637. 26 May 58, 62p. 16 refs. Technical rept. 343; AD-214 552.
Order from LC mi$3.90, ph$10.80 PB 145 781

The separable class of random processes is defined as that class of random processes for which the g-function,

$$g(x_2, \tau) = \int_{-\infty}^{\infty} (x_1 - \mu)\, p(x_1, x_2; \tau)\, dx_1$$

separates into the product of two functions, one a function only of x_2, the other a function only of τ. The second-order probability density function of the process is $p(x_1, x_2; \tau)$ and μ is its mean. Various methods of determining whether a random process is separable are developed, and basic properties of the separable class are derived.

RIAS, Baltimore, Md.
THE BANG-BANG PRINCIPLE, by J. P. LaSalle. Rept. on Contract AF 49(638)382. Nov 59, 23p. 10 refs. Technical rept. 59-5; AFOSR-TN-59-1142.
Order from LC mi$2.70, ph$4.80 PB 145 770

It has for sometime been an intuitive principle that if a system is to be guided to an objective in minimum time and the steering is limited, then optimal steering can only be achieved by at all times using the maximum steering available. This has been called the "bang-bang" principle. The validity of this principle and the extent of control that can be achieved are the main topics discussed in this paper. The system being controlled is assumed to be linear and considered as a function of the time the steering enters linearly. The coefficients need not be constants although some aspects of the constant coefficient case are simpler. (Author)

RIAS, Baltimore, Md.
CONTROLS: AN APPLICATION OF THE DIRECT METHOD OF LIAPUNOV, by S. Lefschetz. Rept. on Contract AF 49(638)382. Dec 59, 20p. 4 refs. Technical rept. 59-8; AFOSR-TN-59-1219.
Order from LC mi$2.40, ph$3.30 PB 146 150

RIAS, Baltimore, Md.
LIAPUNOV'S FUNCTION AND BOUNDEDNESS OF SOLUTIONS, by T. Yoshizawa. Rept. on Contract AF 49(638)382. Dec 59, 15p. 6 refs. Technical rept. 59-7; AFOSR-TN-59-1218.
Order from LC mi$2.40, ph$3.30 PB 146 151

RIAS, Baltimore, Md.
ON THE CHARACTERISTIC EXPONENTS OF LINEAR PERIODIC DIFFERENTIAL SYSTEMS, by Jack K. Hale. Rept. on Contract AF 49(638)382. Dec 59, 20p. 22 refs. Technical rept. 59-6; AFOSR-TN-59-1220. AD-231 589.
Order from LC mi$2.40, ph$3.30 PB 146 149

Rutgers State U., New Brunswick, N. J.
THE CONJUGATE FOURIER-STIELTJES INTEGRAL IN THE PLANE, by Victor L. Shapiro. Rept. on Contract AF 18(600)1595. 27 Oct 58, 5p. 7 refs. AFOSR-TN-58-935.
Order from LC mi$1.80, ph$1.80 PB 145 741

In this report, the following theorem is proved: Let K(x) be a planar Calderon-Zygmund kernel in class Lip $(\alpha, 2)$, $1/2 < \alpha < 1$, and let k(y) be its principal-valued Fourier transform. Let F be a countably additive set function defined on the Borel sets of the plane of finite total variation and let f be the Fourier-Stieltjes transform of F. Then $\int_{E_2} e^{-|y|/R} e^{i(y,x)} f(y)\, k(y)\, dy$ tends to a finite limit almost everywhere as $R \to \infty$. (Author)

Sibley School of Mechanical Engineering, Cornell U., Ithaca, N. Y.
A NOTE ON THE LIMITING RELATIVE EFFICIENCY OF THE WALD SEQUENTIAL PROBABILITY RATIO TEST, by Robert Bechhofer. Technical rept. no. 15 on Contract AF 49(638)230. 8 Jan 60, 7p. 9 refs. AFOSR-TN-60-35.
Order from LC mi$1.80, ph$1.80 PB 145 776

The efficiency (measured in terms of ratio of average sample size to single-sample size) of the Wald sequential probability ratio test relative to the best competing single-sample procedure for testing $H_0 : \theta = \theta_{0_2}$ vs $H_1 : \theta = \theta_1$ $(\theta_0 < \theta_1)$ when X is distributed $N(X \mid \theta, \sigma^2)$ with known σ^2 is studied for fixed $(\theta, \theta_0, \theta_1)$ as the specified probabilities of error, $\alpha = P$ [Reject $H_0 \mid \theta = \theta_0$] and $\beta = P$ [Accepted $H_0 \mid \theta = \theta_1$], approach zero. The limit is shown to depend on the relative rates at which α and β approach zero. In particular, when $a\,\alpha = \beta$ $(a > 0)$ this limiting relative efficiency is equal to $(\theta_1 - \theta_0)/(4 \mid \theta_1 + \theta_0 - 2\theta \mid)$. The practical implications of this result are discussed. (Author)

Washington U., St. Louis, Mo.
THE COHOMOLOGY THEORY OF A PAIR OF GROUPS, by F. Haimo and S. MacLane. Rept. on Contracts AF 49(638)218 and AF [18] (600)1383. Apr 60, 26p. 12 refs. AFOSR-TN-60-115.
Order from LC mi$2.70, ph$4.80 PB 146 781

A cohomology theory is developed for a pair of groups B_1 and B_2 with coefficients in an abelian group A, as in a 1950 paper of R Baer.

Washington U., St. Louis, Mo.
VARIATION DIMINISHING HANKEL TRANSFORMS, by I. I. Hirschman, Jr. Rept. on Contract AF 49(638)218. Apr 60, 40p. 15 refs. AFOSR-TN-60-358.
Order from LC mi$3.00, ph$6.30 PB 146 782

Wayne State U., Detroit, Mich.
ELEMENTS OF THE THEORY OF EXTREME VALUES, by Benjamin Epstein. Technical rept. no. 2 on Contract Nonr-2575(00). 15 Apr 59, 31p. 8 refs.
Order from LC mi$3.00, ph$6.30 PB 145 946

The statistical theory of extreme values has, in recent years, been very useful in connection with a variety of applied problems. However, the engineer faced with the task of learning the elements of this theory and then applying it, finds that the literature is both extensive and difficult. He has to digest many new definitions, terms, and concepts before he can apply the theory. This is neither desirable nor necessary. While the theory of extreme values, viewed in its entirety, is a beautiful and in places esoteric theory, its basic elements can be given in a fairly compact form. Such a presentation is given in this paper.

Wayne State U., Detroit, Mich.
ON THE HOMOTOPY PROPERTIES OF THE COMPONENTS OF THE MAPPING SPACE X^{S^p}, by Sebastian S. Koh. Technical note no. 7 on Contract AF 49(638)179. Mar 60, 14p. 11 refs. AFOSR-TN-60-272.
Order from LC mi$2.40, ph$3.30 PB 146 766

The objective of this note is to study whether the various components of the mapping space of all continuous maps from a given sphere S^p into another sphere S^q are of the same homotopy type. Because of the recent results of the homotopy groups of spheres, more general information has been deduced about the homotopy types of these components than the existing results found by G. W. Whitehead and S. T. Hu fourteen years ago. (Author)

Willow Run Labs., U. of Michigan, Ann Arbor.
UNBIASED, CONTINUOUS PARAMETER ESTIMATORS OF THE MEAN OF RANDOM PROCESSES (AVERAGING FUNCTIONS) by F. J. Beutler. Rept. on Proj. Michigan, Contract DA 36-039-sc-78801. May 59, 17p. 7 refs. Rept. no. 2900-13-T; AD-215 965.
Order from LC mi$2.40, ph$3.30 PB 145 998

A class of realizable weighting functions constitute unbiased estimators of the (invariant) mean of a random process. All such weighting functions are limit equivalent with respect to a stretched or compressed time scale, if a mean square error criterion is employed. These limit properties hold for nonstationary as well as stationary processes. An approximation theorem is stated and proved, the extension of the proof to nonstationary processes again being indicated. The following optimization problem is treated. A nonstationary process has time varying mean a(t), where a(t) is restricted to some specified class. From the set of realizable filters unbiased with respect to a(t), and having memory T, find that filter which gives the best estimate of $a(t_o)$ at time $t_o + t_p$, t_p being an interval over which prediction is required. "Best" is again interpreted in a mean square sense. The solution to the optimization problem is expressed in the form of an integral equation.

Wisconsin U., Madison.
FOURIER TRANSFORMS, CONFORMAL MAPPING, ENTIRE FUNCTIONS, AND ASYMPTOTIC SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS, by Jacob Korevaar. Final rept. for 1 June 51-30 Sep 59 on Contract N7onr-285(07). 1959, 11p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 146 212

(See also PB 136 398)

Computing Devices

Air Force Cambridge Research Center, Bedford, Mass.
INTERPRETIVE ROUTINE FOR COMPLEX NUMBERS, by R. H. Urbano. Mar 59, 11p. Cambridge Computer Series no. 2; AFCRC-TN-59-154; AD-212 462.
Order from LC mi$2.40, ph$3.30 PB 146 153

Air Force Cambridge Research Center, Bedford, Mass.
A NOTE ON LEAST-SQUARES CIRCLES, by R. H. Urbano and H. F. Mattson. Mar 59, 5p. Cambridge Computer Series no. 1; AFCRC-TN-59-153; AD-212 461.
Order from LC mi$1.80, ph$1.80 PB 146 154

Computation Lab., Harvard U., Cambridge, Mass.
DESIGN AND OPERATION OF DIGITAL CALCULATING MACHINERY. Rept. on Contract AF 19(604)4947. 1 Dec 59, 816p. Scientific rept. no. AF-57; AFCRC-TN-60-139.
Order from LC mi$11.10, ph$124.20 PB 145 870

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE MAGNETIC PROPERTIES OF THIN FILMS, by J. B. Goodenough and D. O. Smith. Rept. on Contract AF 19(122)458. 27 Jan 59, 42p. 61 refs. Technical rept. no. 197; AD-210 730.
Order from LC mi$3.30, ph$7.80 PB 146 498

Magnetic properties of thin Permalloy films and also MnBi films which have their easy-magnetization axis

perpendicular to the plane of the film. The engineering parameters of importance for high-speed-memory applications are defined. Several appendices are devoted to some instrumentation that has been found useful in magnetic-film research.

Philco Corp., Philadelphia, Pa.
STUDY AND EXPERIMENTATION IN THE FIELD OF ANALOG-DIGITAL CONVERSION OF SAMPLING AND HOLDING CIRCUITS, by Joseph Yacyk. Final rept. for 15 Feb-15 Aug 59 on Contract AF 19(604)5229. 27 May 59, 27p. Philco 2210-F; AFCRC-TR-59-375.
Order from LC mi$2.70, ph$4.80 PB 145 758

This project consisted of a study program to evolve methods and circuits for sampling an input function by narrow sampling pulses, and storing the sampled value for a time long enough to read and encode it. A number of design specifications were set as an objective for the study. The circuit work during the final three-month period was given to establishing the optimum design of the double diode-bridge circuit, and designing and testing low-distortion input and output circuits.

Stanford Electronics Labs., Stanford U., Calif.
A CLASS OF MULTIPLE-ERROR-CORRECTING BINARY CODES FOR NON-INDEPENDENT ERRORS, by P. Fire. Technical rept. no. 55 on Contract Nonr-225(24). 24 Apr 59, 50p. 10 refs.
Order from OTS $3.30, ph$7.80 PB 145 801

In many data transmission and processing systems, the occurrence of multiple errors within a word is known to be a nonindependent phenomenon, i.e., the probability of an error occurring in a particular binary digit (binit) of the word is conditional on whether any errors occurred in some number of preceding binits. A class of parity-check error-correcting codes, specifically designed to cope with this situation, is described in this paper. These codes have the peculiar property that the check word derived in the normal decoding process is composed of two subwords, one defining the errors' pattern and the other indicating the error pattern's location within the word. The corrupted word is corrected merely by adding the shifted error-pattern subword to the indicated incorrect portion of the received word.

Washington U., Seattle. Div. of Counseling and Testing Services.
A PREDICTOR ELIMINATION PROGRAM WITH PREDICTOR RETAINMENT FOR THE IBM TYPE 650, by Dennis E. Hamilton. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C4). Apr 59, 9p. 5 refs; AD-229 938
Order from LC mi$1.80, ph$1.80 PB 145 797

This program is a modification of the predictor selection programs previously reported. The process utilizes a form of the general matrix reduction theorem developed by Horst and previously reported. The extent of the modification has been to include the following changes in procedure: (1) detection of the predictor variable with the least contribution to the coefficient of predictive efficiency, (2) retainment of any number of the predictor variables until those not designated have been removed from the battery, (3) acceptance of input matrices that have been multiplied by scaling factors. Absolute or differential elimination may be employed.

MECHANICS

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
ELASTIC STABILITY OF THIN-WALLED CYLINDERS AND CONES WITH INTERNAL PRESSURE UNDER AXIAL COMPRESSION, by Robert P. Lofblad, Jr. Rept. on Contract Nonr-1841(22). May 59, 28p. 7 refs. Technical rept. 25-29.
Order from LC mi$2.70, ph$4.80 PB 145 729

A study of the elastic stability of thin-walled pressurized cones was conducted in order to observe buckling characteristics and mode shapes.

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON THE ABSOLUTE MINIMUM WEIGHT DESIGN OF FRAMED STRUCTURES, by Jacques Heyman. Technical rept. no. 36 on Contract Nonr-562(10). May 58, 21p. 3 refs. C11-36; AD-159 730.
Order from LC mi$2.70, ph$4.80 PB 139 064

The following theorem is discussed: if the cross section of the members of a frame is varied continuously so that the strength of the frame follows the bending moment diagram, then, provided the design is carried out in a certain way, the frame will have absolute minimum material consumption. The theorem is applied to determine the minimum weight of some simple continuous beam systems. A trial and error relaxation technique was developed which balances angles of rotation at supports. One of the problems is solved numerically to illustrate the technique. The designs are compared with more practical designs in which the cross-section of the members varies discontinuously.

Brown U. Div of Applied Mathematics, Providence, R. I.
ON THE PROPAGATION OF A CRACK IN AN ELASTIC-BRITTLE MATERIAL, by J. W. Craggs. Technical rept. no. 48 on Contract Nonr-562(10). May 59, 18p. 6 refs. C11-48.
Order from LC mi$2.40, ph$3.30 PB 146 174

Illinois U., Urbana.
INVESTIGATION OF RESISTANCE AND BEHAVIOR OF REINFORCED CONCRETE MEMBERS SUBJECTED TO DYNAMIC LOADING, by A. Feldman and C. P. Siess. Rept. on Contract DA 49-129-eng-344. 30 Sep 56, 158p. 5 refs. Civil Engineering Studies, Structural Research Series no. 125; AFSWP-929; AD-121 624.
Order from LC mi$7.50, ph$24.30 PB 136 240

The primary objectives of the work described in this report were: to adapt the available equipment and manufacture the additional equipment necessary to carry out the proposed tests; to check the operation of the equipment as individual units and as a unified whole; to develop testing techniques through the testing of pilot beams; and to make analyses of various single-degree-of-freedom systems under different loading pulses to obtain information which will be of value in the interpretation of future tests. Among the additional equipment fabricated were reaction measuring supports which simulate simple support conditions while permitting the measurement of uplift as well as downward reaction. Static tests were made on two beam specimens and provided an adequate evaluation of the behavior and reliability of the loading, measuring, and recording equipment.

Brown U. Div. of Engineering, Providence, R. I.
ON THERMALLY STRESSED ELASTIC-PLASTIC SHELLS, by E. T. Onat and S. Yamantürk (Brown U. Div. of Applied Mathematics). Technical rept. no. 12 on Contract Nonr-562(20). May 59, 26p. 5 refs.
Order from LC mi$2.70, ph$4.80 PB 146 169

The elastic-plastic behavior of rotationally symmetric sandwich shells is considered in the presence of the thermal effects arising from thermal straining and the temperature dependence of the yield strength. The mathematical nature of the problem is discussed in some detail for the case of cylindrical shells. (Author)

Illinois U., Urbana.
THEORY OF NON-HOMOGENEOUS ANISOTROPIC ELASTIC SHELLS SUBJECTED TO ARBITRARY TEMPERATURE DISTRIBUTION, by R. E. Miller, A. P. Boresi, and H. L. Langhaar. Technical rept. no. 4 on Contract Nonr-1834(14). Apr 59, 67p. 11 refs. T. & A. M. Rept. no. 143.
Order from LC mi$3.90, ph$10.80 PB 145 784

This paper presents a general theory for small deformations of anisotropic elastic shells subjected to arbitrary temperature distribution. The shells are assumed to be homogeneous through the thickness except for the coefficient of thermal expansion but are otherwise unrestricted with regards to homogeneity and isotropy. The theory is specialized for arbitrary cylinders, circular cones, spheres, and axially symmetrical orthotropic shells of revolution. In addition, two special problems are analyzed. (Author)

Institute of Engineering Research, U. of California, Berkeley.
ON PLANE STRESS SOLUTION OF A COMPRESSIBLE WEDGE WITH THE USE OF MISES' YIELD CONDITION, by A. Kalnins. Technical rept. no. 3 on Contract Nonr-222(69). May 59, 11p. 7 refs. Series no. 131, issue no. 3; AD-220 347.
Order from LC mi$2.40, ph$3.30 PB 146 229

A solution is presented for an acute, compressible, elastic, perfectly plastic wedge in the state of plane stress subjected to uniform pressure on one face. Mises' yield condition and its associated flow rules are employed.

Institute of Engineering Research, U. of California, Berkeley.
ON RIGID BODY DISPLACEMENTS IN THE THEORY OF THIN ELASTIC SHELLS, by P. M. Naghdi. Technical rept. no. 2 on Contract Nonr-222(69). Apr 59, 9p. 4 refs. Series 131, Issue 2.
Order from LC mi$1.80, ph$1.80 PB 146 002

Institute of Engineering Research, U. of California, Berkeley.
ON SAINT-VENANT'S PRINCIPLE: ELASTIC SHELLS AND PLATES, by P. M. Naghdi. Technical rept. no. 1 on Contract Nonr-222(69). Apr 59, 23p. 20 refs. Series no. 131, issue no. 1.
Order from LC mi$2.70, ph$4.80 PB 146 081

This investigation is concerned with an examination of the validity of Saint-Venant's principle in the theory of thin elastic shells and plates. With the aid of an integral formula derived for the displacements and their relevant partial derivatives of all orders at a fixed point of the shell middle surface, the conclusions reached may be roughly stated as follows: If the loads acting on the shell maintained in equilibrium are purely edge loads, then the orders of magnitude of the displacements and stresses are in accord with the traditional statement of Saint-Venant's principle. On the other hand, if the loads on the shell are purely surface loads, then the conclusions concerning the orders of magnitude of the displacements and stresses are the same as those of the modified Saint-Venant principle. (Author)

Institute of Flight Structures, Columbia U., New York.
EFFECT OF VARIATION OF VISCOSITY ON CREEP DEFLECTIONS OF COLUMNS, by G. W. Dillon, Jr. Technical rept. no. 8 on Contract Nonr-266(34). June 59, 46p. 27 refs. CU 2-59-ONR-266(34)-CE; AD-225 531.
Order from LC mi$3.30, ph$7.80 PB 146 514

The problem considered is that of a long column of rectangular cross section of a nonhomogeneous, nonlineraly viscoelastic (Maxwell) material. The nonhomogeneity considered is an exponential variation of the fluidity in the thickness coordinate of the bar. This type of variation might be caused by a linear temperature gradient across the bar. An approximate solution is obtained which yields finite values of the column lifetime (critical time) for a nonlinear material.

Polytechnic Inst. of Brooklyn, N. Y.
ON A COMPARISON OF ELASTICITY AND SHELL THEORY SOLUTIONS, by Jerome M. Klosner and Joseph Kempner. Rept. on Contract Nonr-839(17). May 59, 35p. 14 refs. PIBL rept. no. 493.
Order from LC mi$3.00, ph$6.30 PB 145 726

A shear deformation shell theory is applied to the problem of a long circular cylindrical shell subjected to a uniform circumferential radial line load. Comparisons of the resulting stresses and displacements are then made with the results of the elasticity solution for a ratio of inner to outer radius of the shell equal to 0.9. Classical shell theories are also used in the comparison. (Author)

Purdue U. Div. of Engineering Sciences, Lafayette, Ind.
IMPACT AND MOVING LOADS ON A SLIGHTLY CURVED ELASTIC HALF SPACE, by A. Cemal Eringen and J. Clifton Samuels. Technical rept. no. 13 on Contract Nonr-1100(02). Jan 58, 29p. 1 ref. AD-153 619.
Order from LC mi$2.70, ph$4.80 PB 139 313

Two-dimensional Fourier transforms are employed to threat the two-dimensional dynamic problem of elastic half space having a slightly wavy boundary. The various boundary curves considered include square and triangular-bumps and holes and sinusoidal and periodic boundaries. The number of different types of surface loadings considered are (i) normal tractions and zero shear, (ii) impulsive normal tractions and zero shear, (iii) suddenly applied normal tractions and zero shear, (iv) concentrated normal load and zero shear, (v) concentrated impulsive load and zero shear, (vi) pulsating normal load and zero shear, (vii) moving loads, (viii) pulsating moving loads, (ix) vertical and horizontal loads, (x) moving vertical loads. Stress and displacement components for special cases of the loads described in (i), (iii), (vi), and (vii) acting on a sinusoidal boundary lead to a solution which requires evaluation of a single indefinite integral. Closed form results are given for a uniform pulsating pressure load. (Author)

Rensselaer Polytechnic Inst., Troy, N. Y.
BUCKLING OF A COLUMN WITH RANDOM INITIAL DISPLACEMENTS, by William E. Boyce. Rept. on Contract AF 18(600)1586. 22 Feb 60, 18p. 5 refs. MathRep no. 32; AFOSR-TN-60-150.
Order from LC mi$2.40, ph$3.30 PB 145 863

This paper discusses the relation between the load and the mean transverse displacement of the column when the initial configuration of the column is random in nature.

Rensselaer Polytechnic Inst., Troy, N. Y.
A GENERALIZATION OF THE PHASE RELATIONS IN A FORCED HARMONIC OSCILLATOR, by B. A. Fleishman. Rept. on Contract AF 49(638)514. 18 Dec 59, 12p. 2 refs. MathRep. no. 30; AFOSR-TN-59-1178.
Order from LC mi$2.40, ph$3.30 PB 145 999

When a simple harmonic oscillator is subjected to a sinusoidally varying external force whose frequency is different from the natural frequency of the oscillator, there is a simple and well-known phase relation between the purely forced response and the forcing function. They will have the same or opposite signs (except when both functions vanish) according as the forcing frequency is less or greater than the natural frequency. It is shown here that when the sinusoidal forcing function is replaced by any member of a wide class of periodic functions, the relation between the signs of the forcing function and the forced response continues to hold when the forcing frequency is greater than the natural frequency, but no longer holds in the other case. (Author)

Aerojet-General Corp., Azusa, Calif.
THE MIXING OF VAPOR AND LIQUID JETS, by Joseph Levy. Rept. for 1 July 56-15 Oct 57 on Contract Nonr-869(00). 15 Oct 57, 69p. 4 refs. Rept. no. 1344 (Final); AD-152 896.
Order from LC mi$3.90, ph$10.80 PB 138 085

This study includes an experimental investigation of the processes that occur in the mixing of high-velocity jets of steam and water. The study was aimed at the accumulation of data which may shed light on the mechanism of mass, momentum, and heat transfer in such systems. The present report describes the work during which substantial improvements in the instrumentation were achieved and several series of tests were made. The results of these tests provide precise and detailed information on the processes that occur during the mixing of high-velocity jets of vapor and of cold liquid. The system studied consisted of a central, circular, steam jet surrounded by an annular jet of high-velocity water. The investigations consisted of: A. Traverses across the jets, at various distances from the nozzles, to measure the stagnation temperature, stagnation pressure, and static pressure. B. Traverses along the jet centerline, to measure the same quantities as in A, above. C. Measurements of the total momentum of the resultant water jet downstream of the mixing and condensing region.

Aeronautical Research Inst. of Sweden.
AN EXPERIMENTAL INVESTIGATION OF SUPERSONIC WING-BODY INTERFERENCE AND COMPARISON WITH SECOND-ORDER THEORY, by Georg Drougge and Marten T. Landahl. Technical note no. 2 on Contract AF 61(052)75. Dec 59, 26p. 6 refs. Rept. AU-II-93: 2; AFOSR-TN-60-257.
Order from LC mi$2.70, ph$4.80 PB 145 854

Approximate second-order solutions for the supersonic flow around wing-body combinations were calculated using two different theoretical models. An approximate formula common to the two models was also found for the second-order interference term. In order to test the theory, wind-tunnel experiments on non-lifting cone-cylinder bodies in combination with wings of simple shapes were performed and are described in the present report. Pressure distributions were measured at $M = 3$ and $M = 4$, both around the bodies and on the wings separately, as well as in combination, and it was found that the second-order interference was predicted quite well by the simplified theory. (See also PB 145 854)

Arnold Engineering Development Center [Tullahoma, Tenn.].
"MORGANDYNE" HEAT-TRANSFER TRANSDUCER AND A FLAME-TORCH CALIBRATION TECHNIQUE FOR HYPERVELOCITY WIND TUNNELS, by Charles C. Morgan and Jack C. Andrews. Rept. on ARO, Inc., Contract AF 40(600)800. Feb 60, 73p. 6 refs. AEDC-TR-60-1. AD-232 236.
Order from LC mi$4.50, ph$12.30 PB 145 750

This report describes the transducers and related calibration equipment used to measure the transient heat transfer rates in the arc-heated Hotshot hypervelocity wind tunnels. Thermistor and thin film gages are described briefly, and a variable reluctance Morgandyne gage is covered in detail. Water jet and oxyacetylene torch equipment for the calibration of transient heat transfer gages is described. The torch calibration system has been developed for heat transfer rates from 90 to 400 Btu/ft^2-sec. (Author)

Brown U. Div. of Applied Mathematics, Providence, R. I.
ONE-DIMENSIONAL EQUILIBRIUM SPECTRA IN ISOTROPIC TURBULENCE, by W. H. Reid. Technical rept. no. 27 on Contract Nonr-562(07). May 59, 29p. 12 refs. 562(07)/27.
Order from LC mi$2.70, ph$4.80 PB 145 977

The one-dimensional equilibrium spectra in isotropic turbulence are given for the physical transfer theories of Heisenberg, Kovásznay, and Obukhoff. These results are then compared with the experimental measurements of the spectrum of $\delta^3 u_1/\delta x_1^3$ fluctuations. For two of the theories (Heisenberg's and Kovasznay's) reasonable agreement is obtained for $k\eta < 0.4$ but for larger values of $k\eta$ there is considerable divergence between the theoretical and experimental results. The relationship between the equilibrium and similarity spectra are also discussed for these two theories. (Author)

Guggenheim Jet Propulsion Center, Princeton, N. J.
ONE-DIMENSIONAL REAL FLUID FLOW, by Gerald Rosen. Rept. on Project Squid, Contract Nonr-1858(25). May 59, 19p. 9 refs. Technical rept. PR-89-P.
Order from LC mi$2.40, ph$3.30 PB 146 401

The velocity of unsteady, one-dimensional real fluid flows is rigorously eliminated from the governing equations. A class of exact solutions for polytropic processes is then derived and discussed. The general solution for tangent-gas behavior is presented. (Author)

Institute for System Research, U. of Chicago, Ill.
AERODYNAMIC STUDIES: THE FORCES ACTING ON AN AIR VEHICLE: A REVIEW OF THE LITERATURE [PART 15] by M. Z. Krzywoblocki. Rept. on Scientific and Engineering Research Investigations in Flight Dynamics, Contract AF 33(616)5689. Jan 59, 67p. 199 refs. WADC Technical note 56-360, Pt. 15; AD-161 018.
Order from OTS $1.75 PB 161 548

This work is an annotated bibliography of the scientific literature pertaining to methods of calculating the aerodynamic forces acting on an air vehicle in flight. The present segment of the work includes material reviewed by the author in the period July 1955 through September 1955. The more interesting papers and reports (from the viewpoint of the aerodynamicist) are discussed briefly; others are listed without comment. (Author) (See also PB 161 442)

Institute for System Research, U. of Chicago, Ill.
AERODYNAMIC STUDIES: THE FORCES ACTING ON AN AIR VEHICLE: A REVIEW OF THE LITERATURE [PART 24] by M. Z. Krzywoblocki. Rept. on Scientific and Engineering Research Investigations in Flight Dynamics, Contract AF 33(616)5689. Jan 60, 241p. 996 refs. WADC Technical note 56-360, Pt. 24; AD-161 022.
Order from OTS $3.50 PB 161 549

This work is an annotated bibliography of the scientific literature pertaining to methods of calculating the aerodynamic forces acting on an air vehicle in flight. The present segment of the work includes material reviewed by the author in the period October 1957 through December 1957. The more interesting papers and reports (from the viewpoint of the aerodynamicist) are discussed briefly; others are listed without comment. (Author) (See also PB 161 442)

James Forrestal Research Center, Princeton, N. J.
INTERACTION OF A TWO-DIMENSIONAL INVISCID INCOMPRESSIBLE JET FACING A HYPERSONIC STREAM, by S. H. Lam. Rept. on Contract AF 49(638)465. Mar 59, 34p. 3 refs. Rept. no. 447; AFOSR-TN-59-274; AD-212 708.
Order from LC mi$3.00, ph$6.30 PB 146 018

At hypersonic speeds, if one protrudes a thin spike from the nose of a blunt body, such that the spike is at zero angle of attack with respect to the oncoming stream, the boundary layer on the spike will thicken and separate before it reaches the nose of the blunt body, and it will reattach somewhere downstream on the shoulder of the blunt body. The flow pattern is drastically different from that of a flow over a blunt body without a spike, since the hypersonic flow now effectively flows over a rather slender body. The drag is greatly reduced, and preliminary data show that the heat transfer rate to the blunt body itself is greatly reduced also. The hot spot on this spike-blunt body configuration is now at the tip of the thin spike (and probably also on the part of the spike before separation occurs) which must be protected by suitable cooling.

James Forrestal Research Center, Princeton, N. J.
SHOCK INDUCED UNSTEADY LAMINAR COMPRESSIBLE BOUNDARY LAYERS ON A SEMI-INFINITE FLAT PLATE, by Sau-Hai Lam and Luigi Crocco. Rept. on Contract AF 18(600)498. Sep 58, 111p. 19 refs. Rept. no. 428; AFOSR-TN-58-581; AD-162 101.
Order from LC mi$6.00, ph$18.30 PB 146 017

The physical problem under study in this report is the shock induced two-dimensional unsteady laminar compressible boundary layer on a semi-infinite flat plate. The shock is considered to have constant strength and it advances into a quiescent gas. The flat plate is at zero incidence and is at rest.

Laboratorio di Meccanica Applicata del Politecnico di Torino (Italy).
TRANSONIC FLOWS PAST SYMMETRICAL AIRFOILS WITH ATTACHED SHOCK WAVE ($M_\infty < 1$);

PART II, by Silvio Nocilla. Technical note 9 on Contract AF 61(514)1124. July 58, 28p. 5 refs. AFOSR-TN-58-943; AD-205 083.
Order from LC mi$2.70, ph$4.80 PB 138 056

The present paper pursues a recent study of the A. and extends to the whole field the determination of the transonic flow past symmetrical airfoils at high subsonic free Mach number, with attached shock wave. The developed theory is then applied to the study of "Tomotika - Tamada's profiles" for which the velocity-distribution on the profile, the sonic line and the shock line are numerically determined. (Author)
(See also PB 134 861)

Mississippi State U. [State College].
A NEW SIMPLIFIED FORM OF NAVIER-STOKES EQUATIONS FOR CURVILINEAR FLOWS, by Maneshwar Chandra Mathur. Research rept. no. 24 on Contract Nonr-9/8(01). 30 May 59, 74p. 6 refs. AD-225 177.
Order from LC mi$4.50, ph$12.30 PB 146 258

The flow around elliptical inlets having leading edges of small radii of curvature was studied. By measuring the order of magnitude of terms in the Navier-Stokes boundary layer equations for curvilinear flows, it was found that the second Navier-Stokes equation as simplified by Tollmien was not valid in the region of separation on the leading edge. Two additional terms were found which should be included in the second Navier-Stokes equation for curvilinear flows. The equations were then simplified to a new form. (Author)

Princeton U., N. J.
APPROXIMATE SOLUTIONS FOR SUPERSONIC FLOW OVER WEDGES AND CONES, by A. G. Hammitt and K. R. A. Murthy. Rept. on Contract AF 49(638)465. Apr 59, 25p. 7 refs. Rept. no. 449; AFOSR-TN-59-304; AD-213 088.
Order from LC mi$2.70, ph$4.80 PB 146 007

Approximate solutions for the supersonic flow of a gas at relatively high Mach numbers over wedges and cones are presented. These methods provide simple and accurate results over a wide range of Mach number and specific heat ratios.

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
AERODYNAMIC INVESTIGATION OF SLED CONFIGURATIONS FOR THE HOLLOMAN TRACK, by Rudolf Hermann, Frederick Moynihan, and Walter Melnik. Rept. on Contract AF 29(600)1227. June 59, 210p. 19 refs. AFMDC-TR-59-18.
Order from LC mi$9.30, ph$31.80 PB 145 739

Results of wind tunnel and theoretical investigations of the aerodynamic characteristics of supersonic sleds are presented and discussed. The wind tunnel investigation consists of lift, drag, and pitching moment measurements for families of rectangular and circular cross-section sleds mounted on a simulated Holloman track. Sled geometric variables studied include the effects of height above the trough, slipper beams, nose shape, body shape, body width, body thickness, body length, and angle of attack. For all sled configurations, the ground effect results in positive lift forces and for many the lift is on the order of and even larger than the drag. Some general conclusions to minimize the lift and drag are: keep the sled bottom at or above the rail level; use a semi-pyramid nose with the flat side down; make the sled bottom rounded with the generatrix parallel with the ground; use a body width about three-fourths of a track width; keep the body thickness as small as possible, and if necessary to further reduce the lift, use a small negative angle of attack.

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
BOUNDARY LAYER TRANSITION WITH GAS INJECTION, by C. J. Scott and G. E. Anderson. Rept. on Contract AF 18(600)1226. July 58, 32p. 24 refs. Research rept. no. 151; AFOSR-TN-58-786; AD-202 112.
Order from LC mi$3.00, ph$6.30 PB 145 740

Experiments were conducted on a porous 16^{o} cone at Mach number of 3.7 to ascertain the effects of gas injection on the stability of the laminar boundary layer. Observed zero-heat-transfer transition Reynolds numbers decrease with increased injection but this effect was overcome by the cooling possible with injection. (Author)

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
INTEGRAL LAMINAR BOUNDARY LAYER SOLUTIONS USING THE CROCCO VARIABLES, by C. J. Scott. Rept. on Contract AF 18(600)1226. Aug 59, 23p. 18 refs. Engineering memo. no. 86; AFOSR-TN-59-1304.
Order from LC mi$2.70, ph$4.80 PB 145 775

An analysis is presented which predicts the skin friction and surface heat transfer characteristics of a compressible laminar boundary layer. The present formulation is restricted to constant specific heat and Prandtl number and a linear variation of fluid viscosity with temperature. Regions where the analysis may be extended are pointed out. For the injection cases considered, the coolant gas is considered to be identical to the main stream fluid. Numerical examples are presented for constant pressure, impermeable and permeable surfaces, with upstream and downstream transpiration cooling and strip injection. Surface temperature distributions are presented for the case of constant surface injection with uniform reservoir temperature. In the cases where similarity exists, the method is tested by comparisons with exact solutions which are free from the limitations of the present analysis. (Author)

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
LAMINAR, TRANSITIONAL AND TURBULENT MASS TRANSFER COOLING EXPERIMENTS AT MACH NUMBERS FROM 3 TO 5, by C. J. Scott, G. E. G. E. Anderson, and D. R. Elgin. Rept. for Nov 54-Aug 57 on Contract AF 18(600)1226. Aug 59, 31p. 20 refs. Research rept. no. 162; AFOSR-TN-59-1305.
Order from LC mi$3.00, ph$6.30 PB 145 760

A summary is presented of experimental research work on porous-wall mass transfer cooling effects. Two coolants, air and helium, were included in all of the investigations. Laminar, transitional, and turbulent boundary layers on constant pressure surfaces were investigated using flat plates and cones. A porous hemisphere was used to examine the effect of non-uniform surface pressure. The experimental results covering relatively low temperatures and low speeds confirm analytical boundary layer predictions on the relative effectiveness of the two gases in reducing heat transfer although quantitative agreement does not exist. The available theories do not correctly indicate the general trends of experimental temperature recovery factors. Transition Reynolds number decreases caused by injection could be overcome by the cooling made possible by the injection process. Both laminar and turbulent boundary layers could be "blown-off" the bodies by excessive coolant injection. (Author)

Rosemount Aeronautical Labs., U. of Minnesota, Menneapolis.
MASS TRANSFER COOLING EXPERIMENTS ON A HEMISPHERE AT M=5, by G. E. Anderson, C. J. Scott, and D. R. Elgin. Rept. on Contract AF 18(600)1226. Aug 59, 31p. 16 refs. Research rept. no. 166; AFOSR-TN-59-1306; AD-231 975.
Order from LC mi$3.00, ph$6.30 PB 145 788

A segmented, porous hemisphere was designed and constructed to provide a constant temperature surface with helium mass transfer cooling. The variation of surface heat transfer with helium injection rate and with position on the hemisphere surface was measured. The data is presented along with available analytical results. (Author)

Technische Hochschule, Munich (West Germany).
A NUMERICAL APPROACH TO THE QUESTION OF STABILITY OF SUPERSONIC ENCLOSURES IN AN OTHERWISE SUBSONIC FLOW FIELD, by Wolfgang Werner. Technical note no. 12 on Contract AF 61(514)1080. 7 Dec 59, 36p. AFOSR-TN-60-256.
Order from LC mi$3.00, ph$6.30 PB 145 855

Information is given on a numerical investigation of stability of transonic flows past a profile. An "exceptional" solution is calculated describing a steady, continous transonic flow. This solution is used as initial data for a time dependent numerical calculation. Result seems to indicate existence of stable transonic flows with shocks. (Author)

Technische Hochschule, Karlsruhe (West Germany).
THEORETICAL INVESTIGATIONS ON RING AIRFOILS, by Johannes Weissinger. Rept. on Contract AF 61(514)1207. Jan 60, 115p. 10 refs. AFOSR-TN-60-343.
Order from LC mi$6.00, ph$18.30 PB 146 435

The effects of interference between a ring airfoil and a slender central body are studied. Simple formulas for the lift and the pitching moment are derived from a more thorough theory by considerations taken from lifting line and three quarter point theory. Numerical results are given for ellipsoidal bodies. Two methods for computing the three-dimensional laminar boundary layer on ring airfoils are developed. The first is based on an expansion with respect to the angle of attack, the second is an iteration procedure. In both methods a v. Kármán-Pohlhausen procedure is used. The wall streamlines and the separation line are shown. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

Brown U. Div. of Applied Mathematics, Providence, R. I.
THE MOTION OF A SUBMERGED BODY MOVING VERTICALLY TOWARDS A FREE SURFACE, by T. C. Woo. Technical rept. no. 28 on Contract Nonr-562(07). May 59, 28p. 5 refs. 562(07)/28.
Order from LC mi$2.70, ph$4.80 PB 146 260

The motion of a submerged body moving vertically upwards towards a free surface is treated by three methods. In the image method we approximate the boundary condition on the free surface and thus obtain the velocity potential, the velocity field, etc., by properly adjusting the motion of an image sphere. In the second method use is made of the relation between the velocity potential and the corresponding impulsive pressure system. The last method gives some preliminary results treating the problem in the Lagrangian description of fluid motion. (Author)

Brown U. Div. of Applied Mathematics, Providence, R. I.
REFRACTION SHOCK WAVES IN A NON-UNIFORM OCEAN, by Maurice Holt and Sainsbury L. Strack. Technical rept. no. 18 on Contract Nonr-562(07). May 59, 15p. 3 refs. 562(07)/18.
Order from LC mi$2.40, ph$3.30 PB 146 255

In an ocean the temperature is approximately constant in a shallow layer near the surface; below this layer the temperature decreases with depth. As a result when an explosion is initiated at a point in the non-uniform part of the ocean marked refraction effects occur. These are especially noticeable in the shadow zone formed below the boundary between the uniform and non-uniform regions. Near the source of the explosion the pressure pulse has the usual shape of initial peak followed by exponential decay. In the shadow zone, however, the pulse shape is changed and the initial pressure jump at the head of the wave is followed by a further continuous increase to a maximum behind the front.

Office of Scientific Research and Development. Div. 6.
FLUID DYNAMICS. Summary technical rept. vol. 20, Contract OEMsr-1131. 1946, declassified 17 July 58, 301p. 81 refs.
Order from LC mi$11.10, ph$47.10 PB 139 775

Polytechnic Inst. of Brooklyn, N. Y.
A STUDY OF SIMILARITY TRANSFORMATIONS FOR THE EQUATIONS OF TWO-DIMENSIONAL INCOMPRESSIBLE VISCOUS FLUID FLOW, by Koon-Sang Wan. Rept. on Contract AF 49(638)445. Dec 59, 26p. 9 refs. PIBAL Rept. no. 537; AFOSR-TN-59-1257.
Order from LC mi$2.70, ph$4.80 PB 145 773

In this report, the investigation is carried out to obtain the possible similarity transformations to a laminar flow equation and the Navier-Stokes equation for two-dimensional unsteady and steady flows in both cartesian and polar coordinates. As a result, additional similarity transformations are obtained. These transformations include those obtained previously in the boundary layer theory as special cases. (Author)

Stevens Inst. of Tech., Hoboken, N. J.
FINAL REPORT, by Joel L. Lebowitz. Rept. for 15 June-15 Sep 59 on Contract AF 49(638)352. [1959] 23p. 9 refs. AFOSR-TR-59-150.
Order from LC mi$2.70, ph$4.80 PB 145 714

METALLURGY

American Brake Shoe Co., Mahwah, N. J.
THE MACHINABILITY OF AUSTENITIC MANGANESE STEELS, by Howard S. Avery and Henry J. Chapin. Final summary rept. on Contract NObs-72243. 15 Sep 58, 185p. 51 refs. Metallurgical Dept. Case rept. 1122-5; AD-214 726.
Order from LC mi$8.40, ep$30.30 PB 146 814

Machinability equivalent to that of 304 (19Cr:9Ni) stainless steel together with the strength, economy and non-magnetic properties of 12% manganese steel were sought. The effects of lead, silver, sulfur, selenium, bismuth, zirconium, and carbon were investigated. Of these, bismuth and lower carbon seemed most fruitful. The objectives were considered met by a 20% manganese steel with 0.60%C to which 1% bismuth was added, with a recovery of 0.2-0.4%Bi. This alloy could be lathe turned at 265 SFM, threaded, drilled and tapped. Force requirements and friction in machining are well below those of standard Hadfield's manganese steel. After toughening by water quenching from about 1900°F. this steel is non-magnetic, has Izod impact resistance above 55 foot-lbs., yield strength from 35,000 to 45,000 psi, tensile strength above 87,000 psi and elongation of 40% or more.

Allison Div., General Motors Corp., Indianapolis, Ind.
EFFECT OF BORON CONTAINING HIGH ENERGY FUEL COMBUSTION PRODUCTS ON THE PROPERTIES OF STATICALLY STRESSED HIGH TEMPERATURE ALLOYS, by George L. Vonnegut and William Mahler. Rept. for 1 May 58-31 July 59 on Aviation Fuels, Contract AF 33(616)5753. Jan 60, 70p. WADC Technical rept. 59-317.
Order from OTS $1.75 PB 161 658

Details are presented concerning development and operation of test apparatus, and the results of metallurgical evaluation to determine effects of boron containing (TMBO-TMBA) high energy fuel combustion products on the stress rupture behavior and structures of representative nickel, and cobalt, base high temperature alloys. Results of tests demonstrated that the stress rupture behavior of either stressed or unstressed alloys was not affected by the boron containing fuel combustion products in times up to 50 hours at the respective exposure temperatures. (Author)

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
BRAZING FOR HIGH-TEMPERATURE SERVICE, by A. F. Haskins and R. M. Evans. 29 Mar 60, 15p. 62 refs. DMIC memo. 48.
Order from OTS $0.50 PB 161 198

The purpose of this memorandum is to summarize the extent of advancement in the field of brazing for service temperatures in excess of 600 F. In recent years, the need for parts fabricated from high-temperature, high-strength corrosion-resistant alloys has imposed a demand for brazing filler metals which are compatible with these base metals and their usage usage. The joining of complex structures has, in many cases, demanded that these filler metals be used without flux and that departures from the conventional brazing processes be made. This memorandum is designed to summarize available technical information on the brazing process and the brazing filler metals used to join these high-temperature materials. Because of the volume of literature available, it is impossible to include the tabular and graphical presentations which are so important. Therefore, a rather complete bibliography of source material is included.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
NOTES ON THE DIFFUSION BONDING OF METALS, by R. M. Evans. 20 Apr 60, 10p. 23 refs. DMIC memo. 53.
Order from OTS $0.50 PB 161 203

Industrial Test Lab., Philadelphia Naval Shipyard, Pa.
STUDY OF THE REACTIONS OF THIOUREA IN PICKLING SOLUTIONS UTILIZING RADIOTRACER METHODS, by T. F. Boyd and M. Galan. Feb 59, 17p. 2 refs. Research and Development rept. no. 6200D-5; AD-214 298.
Order from LC mi$2.40, ph$3.30 PB 145 834

The amount of thiourea adsorbed on steel during pickling was determined by radiotracer techniques. Small amounts of thiourea were chemisorbed on the steel. Dissolution of the steel was proportional to acid concentration and time in pickling bath and independent of iron concentration. Inhibition increased rapidly at low concentrations of thiourea, up to about 30 mg/L. The inhibition increased at a significantly lower rate with higher concentrations. When the pickling bath was operated continuously most of the thiourea was decomposed or lost from the solution by

carryout on the steel; only a small amount was accounted for by adsorption on the steel. (Author)

Metallurgical Lab., Norfolk Naval Shipyard, Portsmouth, Va.
RECENT LABORATORY FINDINGS ON HOT DIP GALVANIZED HIGH TENSILE STEEL PLATES, by H. H. Walkup, H. W. Wotring, and L. R. Abbot, Jr. Oct 57, 81p. Development rept. NNSY C-380 Rept. 5387.
Order from LC mi$4.80, ph$13.80 PB 146 233

The bend test and weight of coating requirements for hot dipped galvanized high tensile steel plate of Military Specification MIL-S-16113 B (NAVY) were investigated in order to determine if they are realistic and representative of the coatings on commercially galvanized plates. Also, information was obtained on the galvanizing practices that are used by eleven galvanizing activities, on the relative value of the bend, chisel and hammer tests for determining the adherence of the coatings and on the relation between the results for average thickness of coating as determined by magnetic, micrometer and stripping test methods. (Author)

Nowotny, Hans, Vienna (Austria).
STRUCTURAL INVESTIGATIONS IN COMBINED SILICIDE AND BORIDE CERMETS, by Hans Nowotny. Final technical rept. for 1 Jan 59-20 Jan 60 on Contract DA 91-591-EUC-1009. [1960] 38p. 25 refs.
Order from LC mi$3.00, ph$6.30 PB 145 949

Structural investigations by X-ray techniques established: metal-rich phases in the tantalum-boron system are Ta_2B and Ta_3B_2, metal-rich phases in vanadium-boron and niobium-boron are respectively Nb_3B_2 and V_3B_2 of U_3Si_2-structure. Part of the phase diagram: niobium-boron-silicon has been determined.

Office of Scientific Research and Development. Div. 18.
WAR METALLURGY. Summary technical rept. vol. 1, Contract OEMsr-1131. 1946, declassified 1958, 181p. 609 refs.
Order from LC mi$8.40, ph$28.80 PB 139 772

Republic Steel Corp., Canton, Ohio.
INVESTIGATION OF THE HIGH TEMPERATURE PROPERTIES OF HS88 AUSTENITIC STEEL MODIFIED BY ADDITIONS OF MOLYBDENUM, TUNGSTEN, TITANIUM, BORON, COBALT, ALUMINUM AND NITROGEN, by V. W. Whitmer, S. W. Poole, and R. C. Griffin. Rept. on Contract AF 33(616)178. 1 Feb 54, 37p. 1 ref.
Order from LC mi$3.00, ph$6.30 PB 146 285

A study of the effect of composition modifications on notch toughness of a base analysis containing 11-14% chromium and 13-17% nickel (HS88). The base composition was modified with varying additions of molybdenum, cobalt, tungsten, titanium, boron, aluminum, and nitrogen. The analyses tested, revealed no apparent degree of notch sensitivity when annealed at 1775°F, hot-cold worked 21% and 31% at 1375°F and 1325°F respectively and stress rupture tested at both 1200°F and 1350°F.

(Metallurgy, 15 July 60)

Ferrous Metals

Istituto Elettrotecnico Nazionale "Galileo Ferraris" (Italy).
MAGNETIC VISCOSITY AND ANNEALING IN MAGNETIC FIELD. THEORY OF THE MAGNETIC VISCOSITY DUE TO SOLUTE ATOM PAIRS, by Giuseppe Biorci, Andrea Ferro, and Giorgio Montalenti. Technical rept. 3a on Investigation of Magnetic Relaxation Due to Rotation of Couples of Solute Atoms, Contract AF 61(514)1331. Nov 59, 104p. 73 refs. AFPSR-TN-60-193.
Order from LC mi$5.70, ph$16.80 PB 145 861

The diffusion viscosity due to the rotation of couples of solute atoms in alloys is studied. The relationship between annealing of alloys in a magnetic field and magnetic after-effect is established. The theory has been tested on Fe-Si and Fe-Al alloys of various compositions.

Watertown Arsenal Labs., Mass.
LOW TEMPERATURE PLASTIC FLOW AND FRACTURE TENSION PROPERTIES OF HEAT-TREATED SAE 4340 STEEL, by Frank R. Larson and John Nunes. Dec 59, 56p. 35 refs. Technical rept. no. WAL TR 834.2/1; AD-231 700.
Order from LC mi$3.60, ph$9.30 PB 145 890

True-stress true-strain tension properties of a heat-treated SAE 4340 steel were obtained at a testing speed of 0.01-inch per minute over a range of temperatures from +200° to -196°C. The flow stress at a constant true strain is closely described by a reciprocal absolute temperature function.

Structural Metallurgy and Corrosion

California Inst. of Tech., Pasadena.
METALLURGICAL APPLICATIONS OF ELECTRON PROBE ANALYSIS, by David B. Wittry. Interim technical rept. no. 6 on Design and Development of an Electronic X-Ray Probe for the Study of Alloys and of the Structure of Metals, Contract DA 04-495-ORD-1076. Dec 59, 21p. 16 refs. OOR rept. 1920.1-Met.
Order from LC mi$2.70, ph$4.80 PB 145 724

The concentration profile of chromium in chromized iron. Analysis of the widmanstatten structure in meteoritic iron. Phase identification in titanium-copper and titanium-silver alloys. Concentration fluctuations in solid solution alloys.

Climax Molybdenum Co. of Michigan, Detroit.
DEVELOPMENT OF HIGH STRENGTHS AND HIGH RECRYSTALLIZATION TEMPERATURES IN MOLYBDENUM-BASE ALLOYS, by M. Semchyshen, Gordon D. McArdle and Robert Q. Barr. Rept. on Metallic Materials, Contract AF 33(616)2861. Feb 59, 128p. 9 refs. WADC-TR-58-551; AD-209 383.
Order from OTS $2.75 PB 161 542

Initial studies involved higher alloy castings than had previously been evaluated. Evaluation of the soundness, machinability, hot hardness and forgeability, practicability of preparing large castings in the consumable electrode equipment, and extrusion of large bodies of molybdenum. The most outstanding molybdenum-base alloy developed during this program contained 0.46% titanium, 0.08% zirconium and 0.08% carbon. The alloy required one hour at 2950 F for complete recrystallization. In the stress-rupture test, this alloy required 79,000 psi at 1800 F for rupture in 100 hours. In addition to the ternary alloy, promising elevated temperature properties were exhibited by binary alloys containing 2.00% titanium, (0.14% carbon), and 0.3 and 0.5% zirconium (0.022 carbon).

Dow Chemical Co., Midland, Mich.
PROTECTIVE COATINGS ON MAGNESIUM ALLOYS INTENDED FOR USE ON COMPONENTS OF AIRBORNE VEHICLES. Final rept. for 1 July 57-1 Oct 58 on Contract DA 20-018-ORD-15406. [1958] 111p. AD-215 169.
Order from LC mi$6.00, ph$18.30 PB 146 617

Studies of various metallic coatings for corrosion compatibility with magnesium indicated that tin is superior to all other plates. Combination plates of tin and/or alloys with other metals also were good such as tin-lead, tin-nickel, tin-chromium, tin-zinc and tin-cadmium. Indium also was relatively compatible. Tin plates as thin as 0.0002" were effective. All of these coatings were better than the now commonly used cadmium or zinc as a coating for steel (Fe) fasteners. Tin metallic powder in paint, hot metal spray coatings of tin and tin shims also provided an improved result. Very high purity aluminum gave excellent compatibility when used as a solid fastener but when electrodeposited over steel was quite ineffective. Combinations of a compatible metallic coating and an organic paint coating were more effective than either alone.

Illinois U., Urbana.
FACTORS INFLUENCING FRETTING FATIGUE STRENGTH, by H. T. Corten. Technical rept. no. 46 on The Behavior of Materials under Repeated Stress, Contract N6ori-071(04). June 55, 35p. 17 refs. T & AM rept. no. 88; AD-68 087.
Order from LC mi$3.00, ph$6.30 PB 146 578

The influence of clamping pressure on the fretting fatigue strength of 24S-T aluminum alloy was investigated. The strength was reduced to approximately 50 per cent of the unfretted fatigue strength due to clamping between aluminum clamping pads at a nominal pressure of 4000 psi. The influence of dissimilar clamping pad materials, including aluminum, brass, soft and hard steel, on the fretting endurance limit of hard steel was investigated. The strength of the hard steel specimens, due to fretting against aluminum, soft steel, brass, and hard steel clamping pads, was reduced to 91 per cent, 81 per cent, 59 per cent, and 50 per cent, respectively, of the unfretted endurance limit.

Illinois U., Urbana.
A STUDY OF THE MECHANISM OF FRACTURE IN TORSION, by P. G. Jones and T. J. Dolan. Final rept. on Contract Nonr-1774(01). May 56, 46p. 9 refs. T & AM rept. no. 97; AD-111 222.
Order from LC mi$3.30, ph$7.80 PB 146 576

An experimental investigation was conducted to determine the influence of the amount of available elastic strain energy on the shear fracture characteristics of several metals. Torsion tests were made on solid 1/2 in. cylindrical specimens notched to a root diameter of 3/8 in. Values of strain energy release rate for sudden fracture with no plastic deformation were determined for SAE 8727 Steel and were found to be considerably lower than those reported in the literature for tension and bending of various steels.

Illinois U., Urbana.
A WIRE FATIGUE MACHINE FOR INVESTIGATION OF THE INFLUENCE OF COMPLEX STRESS HISTORIES, by H. T. Corten and G. M. Sinclair. Technical rept. no. 41 on The Behavior of Materials under Repeated Stress, Contract N6ori-71(04). Apr 55, 31p. 6 refs. T & AM rept. no. 81; AD-64 455.
Order from LC mi$3.00, ph$6.30 PB 146 577

A wire fatigue testing machine that operates on the principle of a deflected rotating strut was designed to investigate fatigue life for complex stress histories, particularly those consisting of repeated blocks of cycles. For a comparative study of material behavior, wire fatigue testing incorporates several particularly desirable features, namely inexpensive specimens and small scatter of data.

Materials Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
AN INVESTIGATION OF THE RELATIONSHIP OF HOT-HARDNESS TO THE ELEVATED TEMPERATURE EXTRUSION BEHAVIOR OF SELECTED ARC-CAST MOLYBDENUM BASE ALLOYS, by John Robert Giancola. Rept. for 1 Jan-1 Nov 59 on Metallic Materials. Feb 60, 133p. 41 refs. WADD Technical rept. 59-26.
Order from OTS $2.75 PB 161 669

A study was conducted to determine the relationship between the hot hardness and the required extrusion forces and percent yield of sound material for molybdenum and molybdenum base alloys. The extrusion force was measured while the controllable variables were held constant. It was found that no definite relationship between hot hardness and the extrusion forces or yield of wound metal could be established. Extrusion and hot hardness data are presented for

unalloyed Mo, Mo-Ti, and Mo-Ti-Zr alloys along with apparent relationships between the extrusion temperature and both the average extrusion force and the percent yield. (Author)

Michigan U. Research Inst., Ann Arbor.
STUDIES OF HEAT-RESISTANT ALLOYS, by A. Phillip Coldren, Jerry E. White and others. Rept. for 15 Mar 58-15 June 59 on Refractory Metals, Contract AF 33(616)5466. Feb 60, 108p. 13 refs. WADC Technical rept. 59-606.
Order from OTS $2.50 PB 161 667

Results are reported for an investigation that was carried out to show the effect of hot working on the structure and properties of heat-resistant alloys. The rupture strength of hot rolled "A" Nickel at 100°F seemed to depend primarily on substructure; internal lattice strains as measured by hardness were relatively unimportant. At 800°F the creep resistance of "A" Nickel appeared to depend on internal strains and substructures more or less equally. The rupture properties of A-286 at 1200°F and 1350°F in the hot-rolled plus heat-treated condition could not be correlated with the small variations in the state of the γ'precipitate that were observed. A rough correlation was found between grain size and properties. In a ferritic steel ("17-22-A"V) an improvement in properties was effected by rolling austenite at temperatures too low for recrystallization. In a study of strain aging effects, results of constant-strain-rate tension tests on low carbon steel and A-286 Alloy suggested that forces of chemical attraction between N atoms and Si, Al, or Ti atoms stabilize Cotrell-type atmospheres, permitting them to be effective at higher-than-normal-temperatures. (Author)

Naval Ordnance Lab., White Oak, Md.
SOME ELEVATED TEMPERATURE PROPERTIES OF PRECIPITATION HARDENABLE IRON-ALUMINUM ALLOYS, by W. J. Buehler and C. G. Dalrymple. 8 Jan 60, 19p. 7 refs. NAVORD rept. 6728.
Order from OTS $0.50 PB 161 543

The effects of titanium and titanium plus carbon on some of the elevated temperature properties of the binary iron-aluminum alloys were studied. In every case the titanium-bearing alloys were evaluated in the precipitation hardened condition. A binary 8% aluminum-iron alloy, incapable of precipitation hardening, was used as a control. The data reveal that the titanium additions, when effectively utilized as a stable precipitated second phase, greatly increase the stress-rupture properties of an iron-aluminum alloy containing 8 percent aluminum by weight. (Author)

Naval Research Lab., Washington, D. C.
FACTORS INFLUENCING THE LEAD CORROSIVITY OF DIESTER-BASE OILS, by C. M. Murphy, H. Ravner, and C. O. Timmons. Interim rept. 29 Feb 60, 21p. 21 refs. NRL Rept. 5451.
Order from LC mi$2.70, ph$4.80 PB 144 526

The increase of lead corrosivity during storage of diester-base oils of Specification MIL-L-7808 prevents the stockpiling of adequate reserves. Lead corrosion is due to the progressive formation of the acid half ester (2-ethylhexyl hydrogen sebacate) resulting from the hydrolysis of sebacic acid diesters. Diester hydrolysis is catalyzed by acid phosphates, present in or formed from tricresyl phosphate, the antiwear additive. Aliphatic amines effectively neutralize these strong acids, thus negating their catalytic action. The most positive and generally applicable method of preventing diester oil deterioration is to exclude moisture. (Author)

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
THE SOLUBILITY OF METALS AND ALLOYS IN LEAD-BISMUTH EUTECTIC AT TEMPERATURES UP TO 2200°F, by John F. Collins and H.R. Stephan. 12 Apr 51, 13p. 1 ref. NEPA 1803.
Order from LC mi$2.40, ph$3.30 PB 146 224

A survey of readily available high temperature alloys and metals was made with respect to their solubility in lead-bismuth eutectic. The temperature range of 900° to 2200°F, for times up to 100 hours was investigated. Selected stainless steels, special alloys, and refractory metals were tested by the agitated capsule method developed at NEPA. Evidence of selective solubility of nickel and manganese makes the high nickel alloys undesirable. A. I. S. I. Type 446 showed the least solubility among the alloys and molybdenum was the most resistant of the metals tested. (Author)

Northwestern U. [Evanston, Ill.]
DISLOCATION THEORY OF STRAIN AGING, by T. Mura, E. Lautenschlager and J. O. Brittain. Rept. on Contract AF 18(600)1598. 1 Feb 60, 20p. 6 refs. AFOSR-TN-60-206.
Order from LC mi$2.40, ph$3.30 PB 145 857

The return of the yield point following strain aging is due to the locking of dislocations by a solute atmosphere and is proportional to the number of solute atoms in the atmosphere along the dislocation. The theory was compared with a series of the experiments which were done under several aging temperatures, plastic strains, and aging stresses.

Pitman-Dunn Labs. [Group] Frankford Arsenal, Philadelphia, Pa.
SURVEY OF THE LITERATURE ON SODIUM MODIFICATION OF ALUMINUM-SILICON-MAGNESIUM ALLOYS, by R. C. Harris. Feb 54, 15p. 18 refs. Memo. rept. MR-556.
Order from LC mi$2.50, ph$3.30 PB 146 850

The effects of sodium on the microstructure and mechanical properties of aluminum-silicon alloys are described. From the work done on the subject several theories to account for the microstructural changes have been developed.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THE FEASIBILITY OF NUCLEAR SHIELDING FOR ELECTRONIC CIRCUITRY, by Byron S. Gottfried and Alton L. Long. 24 Oct 58, 17p. 8 refs. USASRDL Technical rept. 1996.
Order from LC mi$2.40, ph$3.30 PB 145 754

Although it is possible to shield against nuclear radiation with known materials, there is no single known material which will effectively shield against all types of radiation emanating from an atomic weapon. An effective radiation shield must, therefore, consist of a combination of several materials, each being chosen for a particular type of radiation. Such a radiation shield would be extremely heavy and bulky. The use of special homogeneous mixtures or coatings offers no escape from the large bulk of material needed to shield against radiation. Therefore, while electronic systems may contain a radiation shield, the decision to employ such a shield should be made only when the designer is well aware of the disadvantages and shortcomings of such a design. (Author)

Fribourg U. (Switzerland).
GAS BUBBLE CHAMBER RESEARCH. Final rept. on Contract AF 61(514)1262. [1958] 37p. 14 refs. AFOSR-TR-60-25.
Order from LC mi$3.00, ph$6.30 PB 145 852

National Bureau of Standards, Washington, D. C.
ISOTOPIC ABUNDANCE RATIOS REPORTED FOR REFERENCE SAMPLES STOCKED BY THE NATIONAL BUREAU OF STANDARDS, by Fred L. Mohler. May 1960, 14p. 32 refs. Technical note no. 51.
Order from OTS $0.50 PB 161 552

The National Bureau of Standards maintains a stock of reference samples of isotopic abundance and this paper gives results that have been reported on measurements of these samples. Some information has been received on 24 of the 32 samples. The paper includes a list of the reference samples and tables of the results reported with notes on these results. (Author)

Nuclear Development Corp. of America, White Plains, N. Y.
DIFFERENTIAL ELASTIC NEUTRON SCATTERING CROSS SECTION OF OXYGEN, by H. Lustig. Final rept. for 17 Dec-30 Sep 59 on Contract DA 18-108-405-cml-295. 1 Nov 59, 16p. 19 refs. NDA 2111-3, Vol. A.
Order from LC mi$2.40, ph$3.30 PB 146 777

A set of elastic scattering angular distributions is presented for neutron energies up to 18 Mev. Calculations undertaken for the determination of resonance parameters in the incident neutron energy region from 2.5 to 4.0 Mev are described. (Author)

Ohio State U. Research Foundation, Columbus.
COLLISION CROSS SECTION STUDY OF CO_2, WITH A THEORETICAL STUDY OF TWO TRANSITIONS, by Jerome C. Shiloff and Edwin N. Lassettre. Scientific rept. no. 10 on Contract AF 19(122)642. July 57, 101p. 41 refs. AFCRC-TN-58-234; AD-228 596.
Order from LC mi$5.70, ph$16.80 PB 139 347

Differential collision cross section and generalized oscillator strengths were determined for 8 peaks in the CO_2 spectrum and at 9 excitation energies in the ionized continuum extending to 79.0 ev. Electrons of incident kinetic energy of about 500 ev are employed throughout. Two weak transitions at about 8.6 and 9.2 ev excitation energy were studied in detail. These transitions are so weak as to suggest that they would be forbidden except for vibrational distortion of the carbon dioxide molecules. Selection rules were treated in detail and a tentative assignment was made. (Author)

Palmer Physical Lab., Princeton U., N. J.
A COUNTER-CLOUD CHAMBER INVESTIGATION OF K^+ MESONS PRODUCED IN COSMIC RAYS, by Herbert Gursky. Doctoral thesis. Technical rept. no. 23 on Cosmic Ray and Elementary Particles Group Group, Contract Nonr-1858(06). 26 May 59, 124p. 37 refs. AD-218 589.
Order from LC mi$6.30, ph$19.80 PB 145 909

An experiment was carried out in which stopping K mesons were observed in a multiple cloud chamber. Simultaneously the decay lifetimes of the particles were recorded by associated electronic components. The cloud chamber was triggered when one scintillation counter recorded a decay coincidence with respect to another counter within a time interval of 15 to 115 mμ sec.

Pittsburgh U., Pa.
SOME CONSEQUENCES OF THE COMPOUND ION MODEL, by Elizabeth Baranger and Edward Gerjuoy. Technical rept. no. 5 on Capture-Loss and Ionization Cross-Sections of Ions and Neutral Particles, Contract Nonr-624(06). Apr 58, 21p. 22 refs.
Order from LC mi$2.70, ph$4.80 PB 138 611

Cross sections for excitation of atoms levels by electrons often vary sharply with energy near threshold, as if resonating with a state of the compound ion. Some consequences of this "compound ion model" of excitation are explored. In particular it is shown that information bearing on the validity of the model can be obtained from measurements of the angular distribution and polarization of the light emitted following excitation to radiating states. Possible applications to Hg and to He are discussed. (Author)

Physics Research Lab., U. of Illinois, Champaign.
TABLES OF CROSS SECTIONS FOR π^+ PHOTOPRODUCTION FROM HYDROGEN, ACCORDING TO THE THEORY OF CHEW, GOLDBERGER, LOW AND NAMBU, by C. S. Robinson. Technical rept. no. 8 on Contract Nonr-1834(05). 22 May 59, 32p.

6 refs. AD-219 255.
Order from LC mi$3.00, ph$6.30 PB 145 897

Contents:
The photoproduction amplitude
The cross section formula
Calculation of quantities in the center-of-mass system
Important dynamical quantities
Calculation of numerical values of differential cross sections
Effect of direct interaction terms appearing in cross section
Angular distributions
Total cross sections

Quartermaster Research and Engineering Center, Natick, Mass.
IRRADIATION "FACTOR-DEPENDENCY": STYRENE (MONOMER), by Ed. F. Degering, Charles Merritt and others. Nov 59, 38p. 6 refs. Radiation Chemistry Lab. series research rept. no. 1.
Order from LC mi$3.00, ph$6.30 PB 145 707

The irradiation-polymerization of vinyl monomers was selected for the evaluation of parameters, inasmuch as procedures for evaluating the over-all results were well defined for certain systems such as monomeric styrene. Results to date on the irradiation-induced polymerization of monomeric styrene, with variations in the parameters, comprise the material for this report.

Stanford U., Calif.
SIGNS OF THE GRAVITATIONAL MASS OF A POSITRON, by L. I. Schiff. Technical rept. no. 42 on Contract AF 18(600)545. Sep 58, 5p. 4 refs. Rept. no. 545-42; AFOSR-TN-58-783; AD-202 008.
Order from LC mi$1.80, ph$1.80 PB 137 536

Suggestions are made that an antiparticle may have the opposite sign of gravitational mass from its corresponding particles. Work is presented to point out that this sign can be determined experimentally in the case of a positron. In these experiments the ratio of gravitational to inertial mass was measured for several substances, and the attempt made to detect differences in this ratio between one substance and another. No definite evidence for such differences was found. In several cases, the uncertainties in the fractional differences of the ratios were less than one part in 10^8 (Author)

Willow Run Labs., U. of Michigan, Ann Arbor.
PHOTOGRAPHY OF COSMIC RAY TRACKS WITH A CASCADE LUMINESCENT CHAMBER, by Lawrence W. Jones and Martin L. Perl. Rept. on Proj. Michigan, Contract DA 36-039-sc-78801. May 59, 14p. 8 refs. Rept. no. 2900-11-T; AD-216 789.
Order from LC mi$2.40, ph$3.30 PB 145 892

The tracks of minimum ionizing particles have been photographed in a luminescent chamber for what is believed to be the first time. A cascade luminescent chamber made up of three image tubes coupled with refractive optics has been used to photograph tracks of cosmic ray μ mesons in a sodium iodide crystal. The very high time resolution and postevent triggering achieved through these experiments will facilitate experimentation with impure beams from acceleration and with cosmic rays. This report describes the apparatus with details of measurement on image tube characteristics and the nature of background. The same type of apparatus is applicable to other problems where very weak light signals (several thousand photons total) must be photographed. (Author)

Instruments and Installations

Battelle Memorial Inst., Columbus, Ohio.
NEUTRON DOSIMETRY RESEARCH, by W. S. Diethorn, E. Paskell and others. Quarterly progress rept. no. 3, 15 Sep-14 Dec 57, on Contract DA 36-039-sc-73174. 24 Mar 58, 44p. 16 refs.
Order from LC mi$3.30, ph$7.80 PB 145 939

Systems of personnel neutron dosimetry are being investigated for application in mixed fields of fast-neutron and gamma radiation. In the first phase of the the study, silicon semiconductor devices and compound semiconductors are being prepared and irradiated for the purpose of determining their response to fast neutron doses less than 600 tissue rads. A paper study of ion-chamber performance during short bursts of high-intensity radiation is being conducted in the second phase of the program. The major purpose of this latter study is to determine the effect of ion recombination on chamber performance. (See also PB 137 194)

Battelle Memorial Inst., Columbus, Ohio.
PERSONNEL NEUTRON-DOSIMETRY SYSTEMS, by W. S. Diethorn, E. Paskell and others. Final rept. on Contract DA 36-039-sc-73174. 15 May 58, 44p. 23 refs.
Order from LC mi$3.30, ph$7.80 PB 145 938

In the early stages of the program three dosimetry areas were investigated: semiconductor devices, ion chambers, and chemical recoil-proton systems. The study on chemical recoil-proton dosimeter systems was terminated at the conclusion of a literature survey on this type of dosimeter. Before experimental work on the ion-chamber phase of the program was initiated the objective of this phase was changed, and subsequent efforts were directed toward a paper study of ion-chamber performance in short-burst, high-intensity radiation fields. In the semiconductor phase of the program studies were restricted to silicon and compound semiconductor devices. (See also PB 145 939)

Nuclear Reactions

Pennsylvania U., Philadelphia.
GAMMA-RAY ACTIVATION OF CARBON, by Leonard D. Cohen. Technical rept. no. 5 on Contract Nonr-551(17). [1959] 89p. 51 refs.
Order from LC mi$4.80, ph$13.80 PB 146 290

In this experiment carbon samples were activated by the monochromatic gamma-rays produced by the reaction $T(p, \gamma)He^4$. The gamma-ray energy was varied over the range 20.1 to 21.1 Mev by varying the energy of the protons produced by a Van de Graaff accelerator. The resolution (80 Kev) and sensitivity (0.4 mb) of this experiment were sufficient to detect structure in the $C^{12}(\gamma, n)C^{11}$ reaction. The results of this experiment show that structure in the reaction $C^{12}(\gamma, n)C^{11}$ does not exist to the extent predicted by L. Katz and co-workers. The results are not inconsistent with broader structure reported from the $C^{12}(\gamma, p)B^{11}$ reaction, the $B^{11}(p, \gamma)C^{12}$ reaction, and the $B^{11}(p, n)C^{11}$ reaction. A reaction cross-section verses photon energy curve for the $C^{12}(\gamma, n)C^{11}$ reaction is given.

Pittsburgh U., Pa.
INELASTIC COLLISION CROSS SECTIONS FOR PROTONS AND ATOMIC HYDROGEN ON MOLECULAR HYDROGEN, by R. Curran and T. M. Donahue. Technical rept. no. 8 on Capture-Loss and Ionization Cross-Sections of Ions and Neutral Particles, Contract Nonr-624(06). Apr 59, 42p. 18 refs.
Order from LC mi$3.30, ph$7.80 PB 145 929

Measurements of the single electron capture cross section, σ_{10}, for protons of energies 2.5 to 60 Kev are reported and measurements of single electron capture and loss cross sections for atomic hydrogen, σ_{01} and σ_{01} respectively, over the same energy range. Reported for the first time are measurements of the total cross section for production of ion pairs by hydrogen atoms in molecular hydrogen.

Sarah Mellon Scaife Radiation Lab., U. of Pittsburgh, Pa.
DEUTERON-INDUCED REACTIONS IN CARBON-14, by Wesley Eugene Moore. Doctoral thesis. Technical rept. no. XI on Precision Scattering of Nuclear Particles, Contract N7onr-32505. Apr 59, 93p. 39 refs. AD-217 716.
Order from LC mi$5.40, ph$15.30 PB 145 791

A study was made of the reactions $C^{14}(d, p)C^{15}$, $C^{14}(d, d')C^{14}$, $C^{14}(d, t)C^{13}$ and $C^{14}(d, \alpha)B^{12}$ using 14.9 Mev deuterons. High resolution magnetic analysis of both the incident beam and the charged reaction particles was used. Nine proton groups were related to the C^{15} ground state and to excited states at 0.745 ± 0.020, 3.09 ± 0.03, 5.94 ± 0.03, 0.38 ± 0.03, 7.32 ± 0.03, 8.41 ± 0.05, and possibly at 4.21 ± 0.03 and 7.47 ± 0.05 Mev. Angular distributions were obtained for 4 of these states and comparison with Butler stripping theory [Proc Roy Soc (London) 208:36, 1951] was used to fix the spins and parities of the C^{15} ground state ($l_n=0$, $J=1/2+$) and first excited state ($l_n=2$, $J=5/2+$). Reduced widths obtained are $\theta^2=0.093$ and 0.032, respectively. Known C^{14} levels were studied by observing the spectrum of inelastically scattered deuterons, and a new level at 7.010 ± 0.020 Mev was discovered. Ratios of reduced widths for the C^{13} 3.09- and 3.86-Mev levels, relative to the C^{13} ground state, indicate that the C^{14} ground state wave function has 0.4 and 13.4 per cent admixtures of $s^4p^8(2s)^2$ and $s^4p^8d^2$ configuration to the s^4p^{10} configuration. The strength of the $s^4p^8d^2$ admixture suggests that the anomalously long beta-decay half-life of C^{14} may be explained without invoking a tensor force. (Author)

Air Force Special Weapons Center, Kirtland AFB, N. Mex.
MAXIMUM PERMISSIBLE ACTIVITY (MPA) OF FISSION PRODUCTS IN AIR AND WATER VERSUS THE AGE OF THE PRODUCTS, by Donald L. Summers. Marvin C. Gaske, and James L. Dick. Dec 58, 14p. 7 refs. AFSWC-TN-58-30.
Order from LC mi$2.40, ph$3.30 PB 146 672

When mixed fission products are present in air and water, the maximum permissible activity (MPA) is dependent on the relative activity of the individual isotopes. This, in turn, is dependent on the age of the products. The MPA can be determined most accurately from measurements of the isotopic concentrations; however, the separation of mixed fission products into their constituent activities is extremely complicated and costly. In order to provide a simple method of evaluating the internal radiation hazard, the MPA's for ideal mixtures of fission products versus their ages were calculated and plotted. The resulting curves show that the MPA's change appreciably with time. An application of the curves can be found in AFSWC TN-58-29, Limits for Radiation Control and Release of Air Force Material Contaminated with Fission Products (Revised), soon to be published.

Lyman Lab. of Physics, Harvard U., Cambridge, Mass.
NUCLEAR SPECTRA OF THE THORIUM ACTIVE DEPOSIT, by Guy Trask Emery. Doctoral thesis. Rept. on Contract Nonr-1866(19). Apr 59, 94p. 228 refs. Technical rept. no. 1-9.
Order from LC mi$5.40, ph$15.30 PB 145 794

The relative intensities of the gamma rays of the descendants of radiothorium have been studied by measuring the photoelectron spectrum from thorium and platinum foils. Some of the previous work on the radiations from the thorium active deposit is reviewed. The level schemes of polonium 212, lead 208, thallium 208, and bismuth 212 are discussed in the light of the information found here and other recent information, and are compared with the predictions of the shell and collective models. A listing of much of the previous work on the radiations from and decay schemes of these nuclei is included.

Materials Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
MEASUREMENT OF SCATTERED GAMMA RAYS IN FOIL ACTIVATION, by Michael P. Charles. Rept. for June 58-Nov 59 on Materials Analysis and Evaluation Techniques. Dec 59, 22p. 5 refs. WADD Technical rept. 59-4.
Order from OTS $0.75 PB 161 687

It is the purpose of this report to determine the scattered radiation component of pure gamma-ray sources used in radiation effects studies. The method to be developed involves the excitation of metastable levels in such materials as In, Cd, Ag, Lu, Hg, Pt,

Hf, Sr, and Rh by gamma-ray inelastic scattering processes. The direct excitation of the metastable states is forbidden, but these levels can be excited indirectly if the Co^{60} gamma rays have been degraded in energy-so that the remaining energy corresponds to that of a level higher than the metastable levels but which decays immediately to the metastable level. Although the cross-sections for gamma-gamma activation at these levels have not been measured, the relative activation of such foils through out the irradiation volume was found to provide considerable information on the energy distribution of scattered radiation in the WADD kilocurie gamma ray sources. (Author)

Naval Research Lab., Washington, D. C.
CRITICAL ANALYSIS OF MEASUREMENTS OF THE GROSS FISSION PRODUCT ACTIVITY IN THE AIR AT GROUND LEVEL, by L. B. Lockhart, Jr. and R. L. Patterson, Jr. Interim rept. 19 Feb 60, 18p. 5 refs. NRL Rept. 5440.
Order from LC mi$2.40, ph$3.30 PB 144 112

A comparison of the fission product radioactivity in the air at a given site as determined by use of different techniques for collection of samples and measurement of radioactivity has shown widely divergent results to have been obtained. A study of the two widely different techniques in use at NRL has demonstrated that these discrepancies are due to the different counting and standardization techniques employed and to the inherent difficulty resulting from the changing β spectrum of fission products with age. The procedures employed for estimation of the radioactivity of samples collected in the NRL 80th-meridian program seem to be relatively insensitive to this changing β energy and to give particularly good results for the older debris. For the most accurate results the radioactivity of some one or more specific isotopes should be followed. (Author)

Stevens Inst. of Tech., Hoboken, N. J.
LITERATURE SURVEY ON THE EFFECTS OF NUCLEAR RADIATION TO ELECTRON TUBE MATERIALS, by E. R. Johnson. Quarterly rept. no. 8, 1 Mar-1 June 59, on Contract DA 36-039-sc-73146. [1959] 20p. 15 refs. AD-220 318.
Order from LC mi$2.40, ph$3.30 PB 145 881

Ceramic tubes when exposed to a total dose of 10^{19} nvt have a residual activity after two weeks exceeding 100 R/hr at the surface. The effect of this high residual activity in relation to tube life is discussed. The effect of nuclear radiation on subminature tubes, thin films, magnetic materials, and secondary emission is discussed. (Author) (See also PB 143 897)

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Arctic Aeromedical Lab., Ladd AFB, Alaska.
SERVICE TEST OF AIRCREW ALERT BOOTS, by Norman C. Van Tassel. July 59, 9p. Technical note AAL-TN-59-14; AD-230 850.
Order from LC mi$1.80, ph$1.80 PB 146 235

The Dehner boot, which was developed for aircrew members operating under environmental conditions encountered within the Alaskan Air Command, was evaluated. The test item is a quick-donning boot equipped with a zipper attachment between 2 sets of laces for rapid placement and adjustability. The boot is put on and laced to fit comfortably. It is then removed by unzipping, and when it is to be donned again, it need only be slipped on and zipped up. Test results obtained from 50 individuals indicated that the boots would provide adequate thermal protection for $0^{\circ}F \pm 10^{\circ}$ depending on the degree of activity of the wearer. Results further indicated that the test boots with leather soles do not provide adequate protection on slippery surfaces, and present a safety hazard. The composition soles did provide adequate traction.

Columbia U. School of Engineering, New York.
THE DETERIORATION OF INVENTORY AND EQUIPMENT, by M. Klein and L. Rosenberg. Technical rept. no. 3 (N) on Contract Nonr-266(55). 15 Apr 59, 31p. 24 refs.
Order from LC mi$3.00, ph$6.30 PB 145 813

This paper describes problems relative to the management of goods which deteriorate. It is traditional to divide this class of items into a "constant efficiency" and a "diminishing efficiency" group.

Naval Supply Research and Development Facility, Bayonne, N. J.
DEVELOPMENT OF SHOE, FLEET, WATER-RESISTANT, by Milton Bailey. Rept. on Service Footwear. 15 Mar 59, 18p. 13 refs. Clothing and Textile Division rept. no. 37; AD 214 707.
Order from LC mi$2.40, ph$3.30 PB 145 832

Decks inundated with water continually pose a hazard to health, safety and well-being of naval personnel. Conventional footgear designed primarily for use on land, fails to afford the required protection when subjected to the corrosive elements of the sea. The inadequate shoes engender ills and discomforts associated with wet feet. The continuous wetting and drying of the shoes accelerate the deterioration process, requiring large stocks and issues to support the fleet. Since specialized footwear is not available, work was undertaken to develop a water-resistant shoe that would resolve these major shipboard problems. As a result, the Shoe, Fleet, Water-Resistant was developed. The new shoe incorporated a combination of advanced components, including water-resistant leather, non-marking heels and soles, and polyethylene counters. A new construction was also incorporated that enabled shoe seams to be sealed which barred the penetration of water through the stitch holes. Characteristics were created which it was expected would enable the new shoe to replace the General Purpose Shoe, the Field Shoe, the Flight Deck Shoe and the need for wearing rubbers with work shoes, and result in one work shoe for the Fleet instead of three. (Author)

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
PROGRESS REPORT NO. 22. Rept. on Contracts Nonr-1841(10), AF 30(635)2872, and AT(30-1)1937. Dec 57, 55p. 14 refs. [RADC TN-58-62; AD-148 615].
Order from LC mi$3.60, ph$9.30 PB 145 849

Dielectric spectroscopy: Volume VI of the tables of dielectric materials, frequency response of ferroelectrics, absorption centers in rutile, and electric spectroscopy of liquids and gases under pressure. Excitation, conduction, and breakdown: Internal photoeffect and exciton diffusion in Cd and Zn sulfides, space-charge build-up in alkali halides, conduction in hexane under high fields, electric conductivity in glass films, optical absorption of rutile, electrical conductivity of magnetite at high temperatures, impulse breakdown of alkali halides, theory of electrons in alkali halides, and instrumentation (Hall effect, IR from 40 to 200μ, and electron microscope). Ferroelectrics and ferromagnetics: Transition to the ferroelectric state in Ba titanate, ferrite properties, magnetic oxides under high pressure, rare-earth Fe perovskites, thermomagnetic measurements, magnetic resonance spectroscopy (paramagnetic defects in Si, and color centers in alkali halides). Single crystals: Garnet single crystals, tricone burner crystal-growing furnace, preparation of very pure alkali halide single crystals, purification of alkali halides by zone refining, influence of oriented growth on the perfection of crystals, color centers in body-centered cubic alkali halides, color centers in alkaline earth fluorides, O impurity in Si single crystals, and vertical divergence correction of the X-ray diffractometer. Ceramics: Reaction rate study in Ni ferrite formation, and atomizing burner performance. (See also PB 137 056)

Rutgers State U., Brunswick, N. J.
ANNUAL RESEARCH REPORT NO. 10. Rept. on Contracts Nonr-404(08) and AF 18(603)06. 1 Sep 56, 15p.
Order from LC mi$2.40, ph$3.30 PB 138 896

This research report is submitted in the form of reprints of publications that have appeared since the last Annual Report. The changes in the low temperature properties of tin produced by impurities. Saturation effect in chrome alum at 9900 gauss and helium temperatures. The magnetic resonance spectrum of dilute iron ammonium alum as a function of temperature. A steady-state free precession nuclear magnetic resonance technique. ,Determination of the quadrupole moment of Al from the splitting of nuclear resonance lines in alums.

Acoustics

Applied Mathematics and Statistics Lab., Stanford U., Calif.
THE SCATTERING CROSS SECTION OF A ROW OF CIRCULAR CYLINDERS, by Tai Tsun Wu and Harold Levine. Technical rept. no. 73 on Contract Nonr-225(11). 26 Mar 58, 42p. 7 refs. AD-162 710.
Order from LC mi$3.30, ph$7.80 PB 139 272

A plane wave is incident on a row of finitt number of equi-spaced infinitely long cylinders of the same size. The direction of incidence is such that only one cylinder is illuminated in the sense of optics. For this geometry, the total scattering cross section is calculated in the limit where the cylinder radius is much larger than the wave length. Both the Dirichlet and the Neumann boundary conditions are treated. In electromagnetic problems, the Dirichlet (Neumann) boundary condition occurs when the electric (magnetic) vector of the incident wave is parallel to the axis of the cylinders. Some simple generalizations of this problem are stated in the final section. (Author)

Harris Transducer Corp., Woodbury, Conn.
THE THEORY OF ACOUSTIC REFLECTORS FOR SONAR APPLICATIONS. REPORT III. GENERAL THEORY OF PASSIVE ARRAYS, by H. K. Farr. Rept. on Contract Nonr-2720(00). 25 May 59, 32p. HTC-73-R3.
Order from LC mi$3.00, ph$6.30 PB 146 259

The purpose of this report is to present some general principles which are useful in analyzing arrays of passive acoustic elements (reflectors). The actual results for arrays of the specific type presently under study will be presented later. Consequently no "practical" results in the form of numerical information are included here. The present analysis is restricted to elements whose surfaces oscillate with some simple specified velocity pattern having an amplitude given by a known linear function of the sound pressure on the surface of the element. Examples of such elements are the end loaded cylindrical resonator (Poisson coupled cylinder) and the variable position resonator (V. P.) discussed in Reports I and II of this series. (See also PB 145 248)

Institute of Flight Structures, Columbia U., New York.
ACOUSTIC PULSE LOADING ON A TWO-DIMENSIONAL RIGID BOX IN THE VICINITY OF A FREE SURFACE, by M. B. Friedman. Technical rept. no. 22 on Contract Nonr-266(08). May 59, 8p. 3 refs. CU-1-59-ONR-266(08)-CE; AD-225 335.
Order from LC mi$1.80, ph$1.80 PB 146 074

The pressure loading on a box-shaped obstacle is determined in the presence of a free surface, produced by the impact of a pulse of constant strength. A period on the order of 2 transit times is considered. The normal to the incident pulse is inclined at 45° with respect to the sides of the box.

Naval Research Lab., Washington, D. C
THEORETICAL ANALYSIS OF ECHO FORMATION IN THE FLUCTUATION ENVIRONMENT OF THE SEA, by R. L. Steinberger. Interim rept. 16 Mar 60, 14p. NRL Rept. 5449.
Order from LC mi$2.40, ph$3.30 PB 144 476

The elements of a simplified geometric concept of the formation of underwater sound echoes are separated

and analyzed. The ever-present nonstatic behavior of the ocean is taken into consideration. The velocity potential of the echo is shown to contain two factors: one Z due to the shape of the reflector, the other A related to the instantaneous surface wave shape. The method of strip subdivision used in geometric optics is suggested for evaluation of the echo factor Z. (Author)

Office of Scientific Research and Development. Div. 6.
PHYSICS OF SOUND IN THE SEA. PART I. TRANSMISSION. [1945] 258p. 120 refs. Reprinted and distributed by the Committee on Undersea Warfare, National Research Council. Summary technical rept. vol. 8, pt. 1.
Order from OTS $4.00 PB 111 202

Contents:
Wave acoustics
Ray acoustics
Experimental procedures
Deep-water transmission
Shallow-water transmission
Intensity fluctuations
Explosions as sources of sound
Transmission of explosive sound in the sea
Note: this report was originally announced in USGRR, v. 20, p. 182, 6 Nov 53

Office of Scientific Research and Development. Div. 6.
PHYSICS OF SOUND IN THE SEA. PART II. REVERBERATION. [1945] 109p. 51 refs. Reprinted and distributed by the Committee on Undersea Warfare, National Research Council. Summary technical rept. vol. 8, pt. 2.
Order from OTS $2.50 PB 111 207

Contents:
Theory of reverberation intensity
Experimental procedures
Deep-water reverberation
Shallow-water reverberation
Variability and frequency characteristics
Note: this report was originally announced in USGRR, v. 20, p. 182, 6 Nov 53

Office of Scientific Research and Development. Div. 6.
PHYSICS OF SOUND IN THE SEA. PART III. REFLECTION OF SOUND FROM SUBMARINES AND SURFACE VESSELS. [1945] 110p. 63 refs. Reprinted and distributed by the Committee on Undersea Warfare, National Research Council. Summary technical rept. vol. 8, pt. 3.
Order from OTS $2.50 PB 111 208

Contents:
Principles
Theory
Direct measurement techniques
Indirect measurement techniques
Submarine target strengths
Surface vessel target strengths
Note: this report was originally announced in USGRR, v. 20, p. 182, 6 Nov 53

Office of Scientific Research and Development. Div. 6.
PHYSICS OF SOUND IN THE SEA. PART IV. ACOUSTIC PROPERTIES OF WAKES. [1945] 120p. 50 refs. Reprinted and distributed by Committees on Undersea Warfare, National Research Council. Summary techincal rept. vol. 8, pt. 4.
Order from OTS $2.50 PB 111 209

Contents:
Formation and dissolution of air bubbles
Acoustic theory of bubbles
Velocity and temperature structure
Technique of wake measurements
Wake geometry
Observed transmission through wakes
Observations of wake echoes
Role of bubbles in acoustic wakes
Note: this report was originally announced in USGRR, v. 20, p. 182, 6 Nov 53

Office of Scientific Research and Development. Div. 6.
PRINCIPLES AND APPLICATIONS OF UNDERWATER SOUND. 1946, declassified 10 Aug 51, 299p. 124 refs. Summary Technical rept. vol. 7.
Order from OTS $4.00 PB 161 682

Contents:
Part 1. Basic principles of underwater sound: theory of an ideal medium; refraction of sound; transmission of sound in the sea; oceanography of sound conditions; echoes, scattering and reverberation; wakes
Part 2. Echo ranging: acoustic output of sonars; target strength and echo level; maximum echo ranges when background noise is limiting; maximum echo ranges when reverberation is limiting; miscellaneous echo ranging applications
Part 3. Listening: the acoustic output of ships and submarines; background noise; hearing and recognition; sonic and supersonic listening
Note: this report was originally announced in USGRR, v. 23, p. 106, 18 Mar 55, as PB 116 199

Ultrasonic Corp., Cambridge, Mass.
UNDERWATER ACOUSTIC SOURCE, by A. A. Fowle and R. W. Moore. Rept. no. 2 (Final) for 1 Dec 51-31 Aug 52 on Contract Nonr-676(00). [1952] 105p. 9 refs. Rept. no. 111-2; AD-15 021.
Order from LC mi$5.70, ph$16.80 PB 146 500

Efforts were directed toward the development of a mechanical underwater sound transducer having an omni-directional one-plane radiation pattern, a frequency of 5 to 20 kc, and a power output of 1 w for a minimum of 8 sec. Three devices were considered: a fluid-driven diaphragm, a water-hammer device, and a Hartmann generator. The first 2 were to operate on pressurized water, and the third device was to operate on pressurized air. These devices did not have the necessary power output, and they required stored energy for operation. Possible uses of the devices are discussed, and theoretical and design data are included.

Willow Run Labs., U. of Michigan, Ann Arbor.
ACOUSTIC RADIATION FROM ISOTROPIC TURBULENCE, by W. C. Meecham and G. W. Ford. Rept. on Project Michigan, Contract DA 36-039-sc-78801. June 59, 10p. 9 refs. Rept. no. 2900-42-T.
Order from LC mi$1.80, ph$1.80 PB 146 254

For low Mach number turbulence, Lighthill has given a result which expresses the acoustic radiation of turbulent fluid in terms of a fourth-rank velocity correlation. Through the use of the Navier-Stokes equation this relation can be put in terms of the space-time pressure correlation. For very large Reynolds number turbulence (in the inertial subrange where Kolmogoroff's similarity principles are valid) this pressure correlation can be written in terms of a function of a single variable. Since the space-time correlation of the pressure is needed, convective effects must be considered. This is done here by introducing a new Lagrangian type of correlation which is defined in such a way that a similarity argument can be applied without difficulty from the convective effects. Such convective effects then enter only through negligible Doppler shifts.

Electricity and Magnetism

Electrical Engineering Research Lab., U. of Illinois, Urbana.
MAGNETODYNAMIC DIPOLAR FERRITE MODES, by William Henry Steier. Technical note no. 2 on Contract AF 18(603)62. 15 Jan 60, 78p. 39 refs. AFOSR-TN-60-135. AD-232 990.
Order from LC mi$4.50, ph$12.30 PB 145 732

An investigation has been made of the magnetodynamic dipolar modes of a ferrite rod between conducting sheets. Critically coupled mode Q's as high as 1100 have been measured. The advantages which these modes possess over other solved ferrite modes are pointed out.

Istituto Elettrotechnico Nazionale "Galileo Ferraris" (Italy).
EFFECT OF NEUTRON BOMBARDMENT ON THE MAGNETIC PROPERTIES OF IRON AND NICKEL OF VERY HIGH PERMEABILITY, II, by Giuseppe Biorci, Andrea Ferro, and Giorgio Montalenti. Technical note no. 2b on Contract AF 61(514)1331. Dec 59, 9p. 2 refs. AFOSR-TN-60-309.
Order from LC mi$1.80, ph$1.80 PB 146 436

Specimens have been irradiated with fast neutrons at room temperature with doses of 4×10^{17} and 1.2×10^{18} n/cm^2. After irradiation no appreciable change in the magnetic properties has been observed on nickel. On iron, on the contrary, a definite reduction of the maximum permeability and a small increase in coercive force, from 2,5 to 3 A/m has been observed.

Minnesota U., Minneapolis.
SINGLE-DOMAIN PARTICLES: NEW USES OF OLD THEOREMS, by W. F. Brown, Jr. Rept. on Contract AF 18(603)113. Feb 60, 29p. 24 refs. AFOSR-TN-60-61. AD-232 991.
Order from LC mi$2.70, ph$4.80 PB 145 858

This article describes applications of potential theory and classical dynamics to the theory of magnetization processes in "hard" magnetic materials. Many such materials owe their magnetic properties to the fact that they are composed of fine ferromagnetic particles separated by less magnetic regions. Calculation of static hysteresis loops requires consideration of stability conditions; analysis of magnetization reversals and of the behavior in microwave fields involves the dynamics of gyroscopic systems.

Electronics

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATIONS OF RARE-EARTH OXIDE CATHODES, by G. B. Gaines. Scientific rept. no. 1 on Contract AF 19(604)5691. 1 Dec 59, 12p. 9 refs. AFCRC-TN-60-108. AD-232 676.
Order from LC mi$2.40, ph$3.30 PB 145 734

The thermionic emission from two samples each of gadolinium oxide and neodymium oxide has been determined. At 1400°C, the emission from one gadolinium oxide sample was about 1 amp/cm^2. At the same temperature, both neodymium oxide samples exhibited an emission of about 0.1 amp/cm^2. The oxides were put on rhenium metal by electrophoresis. (Author)

Case Inst. of Tech., Cleveland, Ohio.
COMMUNICATIONS IN THE PRESENCE OF AN INTELLIGENT NOISE SOURCE. Technical note no. 2 on Contract AF 30(602)1847. Jan 59, 24p. RADC-TN-59-39; AD-210 117.
Order from LC mi$2.70, ph$4.80 PB 146 199

An analysis is made of some of the models discussed previously, and a new model of a communicator and jammer situation is described.

Diamond Ordnance Fuze Labs., Washington, D. C.
TWO-TURN SERIES-CONNECTED LOOP ANTENNA, by J. Herman. 15 Dec 59, 56p. 6 refs. TR-762.
Order from LC mi$3.60, ph$9.30 PB 146 227

The problem of a loop antenna consisting of two equal parallel coaxial turns, series-connected, has been solved and expressed in modal form. A numerical comparison of mode impedences for a single-turn loop and a two-turn loop, each turn having the same physical dimensions as the single turn, indicates that the two-turn loop is equivalent to a single turn of larger diameter than the actual size used. The method of solution is basic and can be extended to the cases of unequal size turns, concentric turns, and multiple turns. (Author)

Electron Tube and Microwave Lab., Calif. Inst. of Tech., Pasadena.
NONLINEAR EQUATIONS DESCRIBING BEAM TYPE CROSSED FIELD TRAVELING WAVE TUBES, by

J. W. Sedin. Technical rept. no. 6 on Contract Nonr-220(13). Oct 57, 33p. 10 refs. AD-158 004.
Order from LC mi$3.00, ph$6.30 PB 137 721

The equations governing the behavior of beam type crossed-field traveling wave tubes are formulated and presented. The geometry is assumed to be two-dimensional. The electron beam is treated as a number of cylinders of charge and space charge forces are included by calculating the field due to such a cylinder when it is placed between two perfectly conducting planes. The nonlinear equations are re-expressed in terms of normalized variables which make them suitable for machine computation. A brief discussion of the procedure for solving these equations numerically is included. (Author)

General Mills, Inc., Minneapolis, Minn.
SPUTTERING YIELDS, by G. K. Wehner. Annual rept. for 1 June 58-31 May 59 on Contract Nonr-1589(15), 31 May 59, 90p. 47 refs. Rept. no. 1902.
Order from LC mi$4.80, ph$13.80 PB 146 170

1. Sputtering yields of metals under normally incident Hg^+-ion bombardment, for liquid gallium and tin, and for solid metals. 2. Diagnosis of discharge conditions. 3. Velocities of sputtered atoms. 4. Sputtering yields in argon for Ag, Au, Cu, Ni, Pd, Fe, Mo, V, Ge, Ti, and Si in the energy range 30 to 600 ev. (See PB 138 569)

Michigan U. Research Inst., Ann Arbor.
CORRELATION BETWEEN NOISE VOLTAGES IN ANTENNA SYSTEMS, by P. G. Cath. Technical rept. no. 88 on Contract DA 36-039-sc-63203. Oct 58, 29p. 2 refs. 2262-190-T; AD-209 744.
Order from LC mi$2.70, ph$4.80 PB 146 253

To calculate the signal-to-noise ratio of the signal resulting when a number of antenna voltages are combined, it is necessary to know the degree of correlation between the individual noise components. In this report mathematical expressions are derived for the correlation between two noise voltages, induced in two antennas placed a known distance apart, assuming that the intensity of the noise arriving from each direction is known. The correlation coefficient is also derived for the nosie voltages generated in two channels of a direction finder. The results are applied, as an example, to the case of a two-element rotatable Adcock antenna. (Author)

Radiation Lab., Johns Hopkins U., Baltimore, Md.
THE FIELD THEORY OF ELECTRONIC WAVE GUIDES, by Philip Parzen. Rept. on Contract AF 33(616)3374. June 58, 119p. Technical rept. no. AF-52; AD-206 288.
Order from LC mi$6.00, ph$18.30 PB 146 698

Contents:
General field equations and small signal approximations
Propagation of space charge waves in electron beams
Effect of thermal velocities in electronic waveguides
Integral equation formulation of the helix sheath traveling wave amplifier

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge,
ELECTRON BEAM WAVES IN MICROWAVE TUBES, by H. A. Haus. Rept. on Contract DA 36-039-sc-64637. 8 Apr 58, 45p. 25 refs. Technical rept. 316; AD-210 913.
Order from LC mi$3.30, ph$7.80 PB 145 783

This paper presents a review of wave propagation along electron beams and of the interaction of these waves with the fields of microwave structures. It also provides the basis for a unified theory of microwave amplifiers with distributed interaction. The small-signal power theorem for beams with zero curl of the generalized momentum is derived. This theorem and the better-known theorem for longitudinal beams are interpreted. The waves along longitudinal beams, cylindrical Brillouin beams, and Brillouin strip-beams in crossed fields are reviewed and their small-signal power flows are studied. The interaction of waves in a longitudinal-beam, traveling-wave tube is analyzed with the aid of Pierce's coupling-of-modes formalism. The small-signal power theorem is used in deciding whether or not exponential growth of a wave signifies gain. Finally, a variational principle is derived for longitudinal beams and beams with zero curl of the generalized momentum. For reasonable trial fields, the principle leads to Pierce's coupling-of-modes formalism, and can also be applied to study cases of stronger coupling than those analyzable by the coupling-of-modes theory. Equations of the magnetron amplifier are derived from the variational principle.

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
THEORY OF NOISY TWO-PORT NETWORKS, by E. Folke Bolinder. Rept. on Contract DA 36-039-sc-64637. 14 June 58, 30p. 50 refs. Technical rept. 344.
Order from LC mi$2.70, ph$4.80 PB 145 782

A new geometric-analytic theory of noisy two-port networks is presented. It is based, geometrically, on the isometric sphere method, a generalization of the isometric circle method to three dimensions, and, analytically, on a three-dimensional conformal transformation which was originally derived by Poincaré and Picard. The transformation is used in a study of transformations of noise ensemble average ratios through bilateral two-port networks. The study is facilitated by interpreting the transformations as non-Euclidean movements in the Poincaré and Cayley-Klein models of three-dimensional hyperbolic space. By a simple extension, noise ensemble average transformations are performed in four-dimensional spaces by means of four-vectors which are analogous to the Stokes vectors used in optics and antenna theory. The new theory has been used for studying several problems pertaining to noisy two-port networks: the Rothe and Dahlke method of splitting a noisy two-port network into noisy and noisy-free parts, cascading of noisy two-port networks, noise tuning and noise matching, the wave representation of noisy two-port networks, and the optimum noise factor. (Author)

Johnson Research Foundation, U. of Pennsylvania, Philadelphia.
MEASUREMENT OF SMALL ABSORBANCY CHANGES IN MICROSPECTROSCOPY AND OF SMALL INTENSITIES IN MICROFLUORIMETRY, by Britton Chance. Annual rept. on Contract Nonr-551(26). [1959] 5p.
Order from LC mi$1.80, ph$1.80 PB 145 812

The purpose of this research is to investigate factors limiting the measurement of small absorbancy changes in microspectrophotometry and of small intensities in microfluorimetry. In the former case, the design, construction and test of a greatly improved form of a "Caspersson-Thorell" apparatus has been completed and its signal to noise ratio has been evaluated both from a theoretical standpoint and from the standpoint of its effectiveness in measuring enzymes in living cells. In addition to this, an alternative method for measuring enzymes themselves has been constructed and tested, namely a differential microfluorimeter of high sensitivity.

Mallinckrodt Chemical Lab., Harvard U., Cambridge, Mass.
MICROWAVE SPECTRUM, INTERNAL BARRIER, STRUCTURE, CONFORMATION, AND DIPOLE MOMENT OF ACETYL FLUORIDE, by Louis Pierce (U. of Notre Dame) and Lawrence C. Krisher. Rept. on Contract Nonr-1866(14). [1959] 28p. 16 refs.
Order from LC mi$2.70, ph$4.80 PB 145 748

The microwave spectra of eight isotopic species of acetyl fluoride are reported.

Mallinckrodt Chemical Lab., Harvard U., Cambridge, Mass.
THE MICROWAVE SPECTRUM OF ACETYL CYANIDE, by Lawrence C. Krisher and E. Bright Wilson, Jr. Rept. on Contract Nonr-1866(14). [1959] 31p. 25 refs.
Order from LC mi$3.00, ph$6.30 PB 145 746

The microwave spectra of eight isotopic species of acetyl cyanide have been investigated in the region 8,000 to 34,000 mc.

Materials Research Lab., Watertown Arsenal, Mass.
HARTREE-FOCK ATOMIC SCATTERING FACTORS FOR THE IRON TRANSITION SERIES, by A. J. Freeman and R. E. Watson (Mass. Inst. of Tech.). Jan 60. 33p. 37 refs. Rept. no. 69.
Order from LC mi$3.00, ph$6.30 PB 145 727

Atomic scattering factors for thirty-five atoms and ions of the iron group transition series (Sc through Cu) have been determined from Watson's recently calculated Hartree-Fock wave functions and compared with other available calculations. Principal scattering factors were also computed, following the methods of Freeman, for the 3d electrons of those atoms containing non-spherical charge distributions.

Naval Research Lab., Washington, D. C.
AN f/3.5 MEDIUM-DISPERSION GRATING SPECTROGRAPH, by F. D. Harrington. 22 Mar 60, 18p. 4 refs. NRL Rept. 5446.
Order from OTS $0.50 PB 161 420

The Meinel spectrograph is a medium-dispersion grating instrument with an aperture of f/3.5. The average reciprocal dispersion is 20.6 A/mm and 10.3 A/mm in the first- and second-order spectra, respectively. In the first order it has a wavelength coverage from 3317 A to 8468 A and a resolution of 0.5 A. The spectrograph was built around an optical design of Dr. A. B. Meinel of the Yerkes Observatory. The collimating and camera elements utilize spherical reflecting surfaces, and the aberrations of the complete optical system are compensated by a Schmidt-type correction mirror. The mechanical features of the spectrograph were designed and built by the U.S. Naval Research Laboratory. Because of its excellent f/number, the spectrograph has found numerous applications where either light levels were low or exposures in the microsecond time region were required. (Author)

Tennessee U., Knoxville.
MOLECULAR FORCE FIELDS OF ETHYLENE, ALLENE FORMALDEHYDE, KETENE AND DIAZOMETHANE by Charles Edward Bailey (Doctoral thesis) and William H. Fletcher. Technical rept. no. 6 on Contract DA 33-008-ORD-1166. 20 Dec 58, 191p. 54 refs. OOR rept. 1505.8-P; AD-209 779.
Order from LC mi$8.70, ph$30.30 PB 146 799

The orbital valency force field has been applied to C_2H_4, C_3H_4, CH_2O, CH_2CO, and CH_2N_2. Vibrational potential energies were simplified by assuming negligible H—H repulsions; the results justify this assumption. The repulsive force between non-bonded C and H atoms in C_2H_4, C_3H_4, and CH_2CO, and the non-bonded O and H atoms in CH_2O agreed with the calculated repulsion based on a Lennard-Jones potential. In CH_2N_2, an electrostatic attractive force was observed between the H atoms and one of the N atoms greater than the repulsive force between the H atom and the central N atom. Agreement between calculated frequencies and observed frequencies is excellent. (Author)

Texas A. and M. Coll., College Station.
ELECTRONIC SPECTRA OF SIMPLE MOLECULES, by J. B. Coon. Final rept. on Contract AF 18(600)439. 17 Dec 59, 27p. 80 refs. AFOSR-TR-59-206.
Order from LC mi$2.70, ph$4.80 PB 145 837

It is the purpose of the present program to obtain information about excited electronic states of simple molecules through a study of the ultraviolet absorption spectra of their vapors. Such experimental information is important for comparison with theoretical studies of the electronic structure of molecules which in turn lead to the prediction of the chemical and physical properties of the molecules in their various excited states.

Washington U., Seattle.
AFTERGLOW SPECTROSCOPY, by K. C. Clark. Final summary rept. for 1 Mar 56-15 Sep 58 on Contract AF 18(603)36. [1958] 8p. 13 refs. AFOSR-TR-60-4; AD-232 340.
Order from LC mi$1.80, ph$1.80 PB 145 853

Covers the following: (1) general discussion, (2) vacuum ultraviolet spectrometer, (3) echelle spectrograph, (4) diffusion gauge for active particles, (5) measurement of atom concentrations, (6) decay by three-body volume processes, (7) exponential decays, (8) diffusion rates and surface effects, and (9) quenching and stimulated emission.

Optics

Cornell U., Ithaca, N. Y.
X-RAY ABSORPTION COEFFICIENTS AND GEOMETRICAL COLLIMATION OF THE BEAM, by L. G. Parratt, J. O. Porteus and others. Technical rept. no. 14 on Contract AF 18(600)300. 1 Sep 58, 14p. 15 refs. AFOSR-TN-58-755; AD-201 614.
Order from LC mi$2.40, ph$3.30 PB 138 143

In recent years, in order to achieve high angular collimation of an intense x-ray beam in a measurement of an absorption coefficient, most investigators have used the action of a high-resolving-power monochromator to provide the collimation. In this case, if the absorber exhibits small-angle scattering (including multiple scattering) of significant intensity in a scattering cone as large as a few seconds of arc, the value of the coefficient depends upon the absorber-position with respect to the monochromator. A few measurements are reported with a two-crystal spectrometer to illustrate the points discussed. (Author)

Naval Research Lab., Washington, D. C.
INFLUENCE OF ATMOSPHERE ON OPTICAL RESOLUTION IN A TYPICAL NEVADA TUNNEL, by A. G. Rockman. Final rept. 31 Mar 60, 10p. 2 refs. NRL rept. 5459.
Order from LC mi$1.80, ph$1.80 PB 145 519

Tests were conducted to determine the optical resolution of an f/3.8 optical relay system (magnification 0.25) over a 1000-foot path in a Nevada tunnel and under a variety of atmospheric conditions. It was also necessary to measure the refractive bending of light beams under similar conditions. Theoretical (Rayleigh) resolution of a single optical element (lens or mirror) two feet in diameter working at a magnification of 0.25 with an object distance of 1000 feet would be about 14 lines/mm. The test system produced airpath resolutions of 6.4 to 9 lines/mm. The resolution apparently was not a function of direction or velocity of air flow in the tunnel system.

Office of Scientific Research and Development. Div. 16.
IMAGE FORMING INFRARED. Summary technical rept. vol. 4, Contract OEMsr-1131. 1946, declassified 17 July 58. 157p. 89 refs.
Order from LC mi$7.50, ph$24.30 PB 139 773

Office of Scientific Research and Development. Div. 16.
NON-IMAGE FORMING INFRARED. Summary technical rept. vol. 3, Contract OEMsr-1131. 1946, declassified 23 Apr 58, 408p. 188 refs.
Order from LC mi$11.10, ph$60.60 PB 139 783

Polaroid Corp. [Cambridge, Mass.]
THE BOLOMETER WINDOW, by Jean T. Eddy and Mark Hyman, Jr. Final rept., Vol. II, Section A, Part 3 on Contract NOrd-6013. Mar 46, declassified 21 Oct 59, 11p.
Order from LC mi$2.40, ph$3.30 PB 146 273

An infrared filter with a transmission of 1% at 2 microns and of 75% at 9 microns has been developed for the bolometer window.

Polytechnic Research and Development Co., Inc., Brooklyn, N. Y.
INVESTIGATION OF PHOTOCONDUCTORS FOR INFRA RED DETECTION, by Floyd Banks. Final rept. on Contract N7onr-415, T.O. 2. 27 June 49, 45p. 18 refs. ATI-178 303.
Order from LC mi$3.30, ph$7.80 PB 146 608

The procedures followed during the course of the investigation fall conveniently into two categories; experiments with bulk material, and experiments with thin films, both evaporated and sputtered. The materials studied in bulk form were silver chloride silver sulphide, zinc oxide, and metal-to-insulator boundaries (samples of lead sulphide and molybdenum sulphide were prepared but no serious work attempted with them). The thin films studied were tellurium.

Radio Corp. of America, Princeton, N. J.
INFRARED PHOTOCONDUCTORS. Interim rept. no. 1, 9 Jan-9 Apr 50, on Contract N6onr-23603. 1 July 50, 16p. ATI-82 772.
Order from LC mi$2.40, ph$3.30 PB 146 612

An interim report is presented on infrared photoconductors, which have longer wavelength response than those at present known. It is shown that such photoconductors are either intrinsic or impurity-activated semiconductors for which the energy gaps between the uppermost filled band and the conduction band are small. The photon energy corresponding to 12 mu radiation is approx 0.1 ev. Therefore, a necessary condition for the existence of long wavelength photoconductivity is the existence of energy levels separated by about this amount and between which electronic transitions are permitted. Long wavelength response will be exhibited only by materials cooled to low temperature. A survey is made of suitable materials and data are given also on the behavior of "secondary" photoconductors.

Radio Corp. of America, Princeton, N. J.
INFRARED PHOTOCONDUCTORS. Interim rept. nos. 2-5, 9 Apr 50-Apr 51, on Contract N6onr-23603. July, Oct 50, Jan, Apr 51. 4 nos.
Order from LC

Interim rept. no. 2, 9 Apr-9 July 50, 32p. ATI-93 358 mi$3.00, ph$6.30, PB 146 613
Interim rept. no. 3, 15 July-15 Oct 50, 23p. ATI-92 420, mi$2.70, ph$4.80, PB 146 614
Interim rept. no. 4, Oct 50-Jan 51, 27p. ATI-96 721, mi$2.70, ph$4.80, PB 146 615
Interim rept. no. 5, Jan-Apr 51, 28p. ATI-105 728, mi$2.70, ph$4.80, PB 146 616
(See also PB 146 612)

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
LIGHT, by George W. Stroke. Rept. on Contract DA 36-039-sc-78108. 9 Jan 59, 35p. 38 refs. Technical rept. 348; AD-216 193.
Order from LC mi$3.00, ph$6.30 PB 146 177

Contents:
General nature and theories of light
Classification of phenomena and theories involving light
Electromagnetic wave character of light
Relativistic effects in the behavior of light
Corpuscular nature of light

Solid State Physics

Army Signal Research and Development Lab., Fort Monmouth, N. J.
MICROWAVE TECHNIQUES IN MEASUREMENT OF LIFETIME IN GERMANIUM, by A. P. Ramsa, H. Jacobs and F. A. Brand. 20 Oct 58, 21p. 7 refs. USASRDL Technical rept. 2004; AD-214 648.
Order from LC mi$2.70, ph$4.80 PB 145 753

A new method of measurement of lifetime in germanium single crystals is described. The technique utilized the absorption of microwave power upon injection of minority carriers. An analysis was made of possible experimental errors. (Author)

Brown U., Providence, R. I.
SOME SURFACE PROPERTIES OF INDIUM-ANTIMONIDE CRYSTALS. I. LOW-ENERGY ELECTRON-DIFFRACTION MEASUREMENTS, by H. E. Farnsworth, J. A. Dillon, Jr. and others. Final scientific rept. for 1 Sep 56-30 Sep 59 on Investigations of Surface Properties of Silicon and Other Conductors, Contract AF 19(604)1952. [1959] 21p. 9 refs. AFCRC-TR-59-197; AD-229 060.
Order from LC mi$2.70, ph$4.80 PB 145 930

Low energy electron diffraction studies have been made of five (111) and (11$\bar{1}$) surfaces of InSb which were cleaned by argon ion bombardment and annealing. From the diffraction patterns obtained in both (110) and (112) azimuths, a double-spaced structure of surface atoms appears to be present on (111) and (11$\bar{1}$) surfaces. Exposure to oxygen resulted in a gradual decrease in intensity of all beams, indicating that an amorphous layer of oxygen was formed. The sticking coefficient for oxygen on the cleaned surfaces has a maximum value of 10^{-5}, and appears to be similar on both (111) and (11$\bar{1}$) surfaces. The cleaned surface pattern could be regenerated by heating the crystal at about 330°C for approximately one hour. Studies of InSb surfaces heated in vacuum while continuously observed with a microscope showed the formation, above about 400°C, of small flattopped hillocks which migrated over the heated surface. (Author) (See also PB 142 810)

California U., Los Angeles.
STRESS FIELD OF A UNIFORMLY PLASTICALLY DEFORMED CRYSTAL IN AN AGGREGATE, by T. H. Lin and S. Uchiyama. Rept. on Contract AF 49(638)20. Oct 59, 35p. 14 refs. AFOSR-TN-59-1048
Order from LC mi$3.00, ph$6.30 PB 145 867

Contents:
Application of single crystal
Characteristics to polycrystals
Equivalence of plastic strain gradient to body force
Calculation of stress distribution caused by a uniformly slipped region in an elastic medium

Carnegie Inst. of Tech., Pittsburgh, Pa.
ANALYTIC PROPERTIES OF BLOCH WAVES AND WANNIER FUNCTIONS, by W. Kohn Technical rept. no. 7 on Contract Nonr-760(13). 16 Jan 59, 41p. 6 refs.
Order from LC mi$3.30, ph$7.80 PB 145 928

The one dimensional Schroedinger equation with a periodic and symmetric potential is considered, under the assumption that the energy bands do not intersect. The Bloch waves, φ_{nk}, and energy bands, E_{nk}, are studied as functions of the complex variable, k. In the complex plane, they are branches of multivalued analytic and periodic functions, φ_k, and E_k, with branch points, k', off the real axis. A simple procedure is described for locating the branch points. Application is made to the power series and Fourier series developments of these functions. The analyticity and periodicity of φ_{nk} has some consequences for the form of the Wannier functions. In particular, it is shown that for each band there exists one and only one Wannier function which is real, symmetric or anti-symmetric under an appropriate reflection, and falling off exponentially with distance. The rate of fall off is determined by the distance of the branch points k' from the real axis. (Author)

General Atomic, San Diego, Calif.
RESEARCH IN RADIATION DAMAGE IN SEMICONDUCTORS, by J. W. Harity, H. Horiye and others. Final rept. on Contract AF 19(604)3899. 10 Feb 60, 162p. 31 refs. GA-1201; AFCRC-TR-60-117.
Order from OTS $3.00 PB 161 673

The purpose of the experimental program was to study the effect of irradiation on semiconducting materials and to apply this knowledge to fabricate a radiation-resistant diode. This program of research was carried out utilizing various facilities at General Atomic. High-energy 25-Mev electron bombardment done with the linear accelerator and neutron bombardment done with the TRIGA reactor were used to study the electrical properties of germanium and silicon as

a function of total irradiation between 78° and 300°K. The electrical properties studied were the conductivity, Hall effect, and carrier lifetime. The carrier removal rate was found to be 4.0 electrons per centimeter of 25-Mev electron path in germanium at 78°K, compared with 0.18 in silicon at 300°K. Two hole-trapping levels were found in germanium with energies above the valence band of 0.15 and 0.27 ev. Evidence of annealing was also observed between 78°K and room temperature in germanium. The result of these studies was the fabrication of a radiation-resistant diode using p-type germanium with a resistivity of about 0.20 ohm-cm as the base material.

Hebrew U. (Israel).
OPTICAL PROPERTIES OF PARAMAGNETIC SOLIDS, by W. Low. Technical note no. 10 on Contract AF 61(052)59. Aug 59, 29p. 36 refs. AFOSR-TN-60-168.
Order from LC mi$2.70, ph$4.80 PB 145 862

The transition groups show absorption and fluorescence spectra characteristic of the particular ion and of the crystal surroundings. Certain regularities are shown to exist in the intensities of the absorption lines and line width of these transition groups.

Institute of Tech., U. of Minnesota, Minneapolis.
STUDY OF NOISE IN SEMICONDUCTORS AND SEMICONDUCTOR DEVICES, by A. van der Ziel. Quarterly rept. no. 3, 1 Dec 58-1 Mar 59, on Contract DA 36-039-sc-78009. [1959] 71p. 6 refs.
Order from LC mi$4.50, ph$12.30 PB 146 028

There have been reports of discrepancies between theory and measurements of noise in silicon transistors. A program of measurement of noise in silicon transistors has been undertaken. Preliminary results of this program are presented in this report. These results indicate that discrepancies do exist; there is a frequency dependent divergence from the theoretical value at very low injection levels; there is a marked increase in noise at high injection levels. An experimental expression for the noise in the mid-current region is presented which fits the experimental curve better than the present theoretical expression. A revised method of measurement is presented. This method of measurement is to be used for the measurements of noise in transistors and should permit a significant increase in the speed and accuracy of collecting data. A theory is presented which demonstrates the correspondences between carrier diffusion and signal propagation on a transmission line. The analogy is used to solve for the spectral density of the fluctuations in the total number of carriers in a one-dimensional semiconductor with surface recombination. It is found that this approach clarifies several points of confusion found in previous treatments. (Author) (See also PB 142 765)

Institute of Tech., U. of Minnesota, Minneapolis.
STUDY OF NOISE IN SEMICONDUCTORS AND SEMICONDUCTOR DEVICES, by A. van der Ziel. Quarterly rept. no. 5, 1 June-1 Sep 59, on Contract DA 36-039-sc-78009. [1959] 122p. 24 refs.
Order from LC mi$6.30, ph$19.80 PB 146 490

The gain, bandwidth and noise figure of wideband transistor amplifiers are discussed. Silicon transistor noise measurements show deviations from theory. The equivalent circuit theory of semiconductor noise is extended. (See also PB 146 028)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
TRANSMISSION LINE FORMULATION FOR SEMICONDUCTORS, by Herbert Kurss. Quarterly rept. no. 10, 1 Oct-31 Dec 58 on Contract DA 36-039-sc-73052. 30 Mar 59, 14p. 1 ref. Rept. R-523.29-59; PIB-453.29; AD-218 108.
Order from LC mi$2.40, ph$3.30 PB 145 825

A "transmission line" analysis of wave propagation in media with a transverse periodicity is given. For a periodically layered crystal the manner in which the network problem must be supplemented by information relating to the third translational symmetry vector is indicated. (See also PB 140 019)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
TRANSMISSION LINE FORMULATION FOR SEMICONDUCTORS, by Herbert Kurss. Quarterly rept. no. 11, 1 Jan-31 Mar 59, on Contract DA 36-039-sc-73052. 15 June 59, 17p. 8 refs. Rept. R-523.32-59; PIB-453.32; AD-225 231.
Order from LC mi$2.40, ph$3.30 PB 145 896

In the neighborhood of the source point, the (scalar) Green's function of a rectangular waveguide with phase shift boundary conditions is shown to be approximately a free space (scalar) Green's function augmented by a finite number of plane waves. These plane waves are then expanded into a series of spherical waves to obtain readily computable formulae for the so-called structure constants. (Author) (See also PB 140 019)

Ohio State U. Research Foundation, Columbus.
SOLID-STATE LOGICAL TRANSDUCERS, by F. E. Battocletti, E. C. Orris and others. Rept. on Research on Physical Phenomena Affecting the Characteristics of Electronic Components, Contract AF 33(616)5923. Feb 60, 39p. 12 refs. WADC Technical rept. 59-686.
Order from OTS $1.00 PB 161 668

Theoretical and experimental investigations of methods of performing complex logical operations with semiconductor devices are described. It is shown that every n-ary connective may be constructed from, at most, two (n-1)-ary connectives and a single-pole double-throw switch. The effects considered for use, either singly or in combination, in fabricating logic circuits include the field effect, punch through, four-layer switch, avalanche breakdown, and the tunnel effect. Experimental techniques that were used in making diffused junctions, oxide masks, and thermal compression bonds are discussed. Only very preliminary results were obtained in experiments on functioning devices. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
GALVANOMAGNETIC EFFECTS AND THE BAND STRUCTURE OF ANTIMONY, by Sandor J. Freedman (Doctoral thesis) and Hellmut J. Juretschke. Technical rept. no. 6 on Contract Nonr-839(06). 15 Apr 59, 87p. 23 refs.
Order from LC mi$4.80, ph$13.80 PB 145 811

The energy band structure of antimony is deduced from room temperature galvanomagnetic measurements and their interpretation in terms of a theoretical model.

Purdue Research Foundation, Lafayette, Ind.
SEMICONDUCTOR RESEARCH. Quarterly rept. no. 9, 1 Aug-31 Oct 58, on Contract DA 36-039-sc-71131. [1958] 36p. 22 refs.
Order from LC mi$3.00, ph$6.30 PB 145 884

Contents:
States associated with vacancies in non-ionic lattices
Technique for measurement of small length increments
Preparation and testing of single crystals
Infrared absorption in neutron irradiated silicon
Impurity photoconductivity in germanium
Paramagnetic resonance in irradiated silicon
Specific heat of silver-manganese
Specific heat of molybdenum-rhodium
Transport properties of germanium at low temperatures
Magnetic susceptibility
Impurity band conduction in silicon
Resistivity of some germanium samples between 0.3 and 4°K
Bulk conductivity at high electric fields
Diffusion of copper in germanium

Purdue Research Foundation, Lafayette, Ind.
SEMICONDUCTOR RESEARCH. Quarterly rept. no. 11, 1 Feb-30 Apr 59, on Contract DA 36-039-sc-71131. [1959] 39p. 32 refs.
Order from LC mi$3.00, ph$6.30 PB 145 883

Contents:
Preparation and analysis of crystals
Gauge transformation in perturbation theory
Thermal capture of electrons by vacancies
Conductivity at high electric fields (Cu-doped Ge)
A note on accuracy of Hall coefficient measurements
The transport properties of semiconductors at low temperatures
Impurity photoconductivity in germanium
Impurity conduction in silicon
Magnetic susceptibility
Contribution of the nucleus to the specific heat of rhenium
Nuclear specific heat of gallium and zinc
Infrared absorption and photoconductivity of irradiated silicon
Spin resonance in neutron irradiated silicon
(See also PB 145 884)

Purdue Research Foundation, Lafayette, Ind.
SEMICONDUCTOR RESEARCH. Quarterly rept. no. 13, 1 Aug-31 Oct 59, on Contract DA 36-039-sc-71131. [1959] 47p. 14 refs. AD-230 348.
Order from LC mi$3.30, ph$7.80 PB 146 497

Contents:
Choice of gauge in perturbation theory
Preparation and analysis of semiconductor single crystals
High perfection silicon crystals
Low temperature mobility in p-type germanium
Non-injecting contacts for n-type germanium
Transport properties of germanium at low temperatures
Impurity conduction in silicon
Resistivity of germanium at very low temperatures
Specific heat of indium
Infrared absorption in irradiated silicon
Fast infra-red detector
Magnetic susceptibility
Spin resonance in neutron irradiated silicon

Purdue Research Foundation, Lafayette, Ind.
SILICON CRYSTAL PERFECTION STUDY, by H. J. Yearian. Quarterly rept. no. 4, 1 Mar-31 May 59, on Contract DA 36-039-sc-77991. [1959] 20p. 6 refs. AD-225 165.
Order from LC mi$2.40, ph$3.30 PB 146 486

High perfection single crystals of Si have been pulled from a quartz crucible heated by a current regulated carbon resistance furnace using a well etch dislocation free seed 0.2mm in diameter. A regulated Lepel RF converter and zone refining jig were modified to permit conventional floating zone crystal growing with 1/2" rods.

Rochester U., N. Y.
ELECTRON-HOLE PAIR PRODUCTION, by D. L. Dexter (RCA Labs.). Rept. on Contract AF 49(638)432. Jan 60, 23p. 13 refs. AFOSR-TN-60-99.
Order from LC mi$2.70, ph$4.80 PB 145 733

We compute for a fairly general band structure the transition probability for across-the-gap impact ionization by a fast particle in a semiconductor, taking into account various possibilities involving tensor masses, non-equivalent energy surfaces, umklapp-processes, etc. Some discussion is given of possible uses of the results. (Author)

Rutgers [State] U., New Brunswick, N. J.
HIGH NEGATIVE NUCLEAR POLARIZATIONS IN SOLUTIONS OF FREE RADICALS, by L. H. Bennett and H. C. Torrey. Doctor's thesis. Rept. on Contract AF 18(603)6. 26 Jan 60, 22p. 24 refs. AFOSR-TN-60-107.. AD-232 622.
Order from LC mi$2.70, ph$4.80 PB 145 839

A double magnetic resonance experiment in which negative proton spin polarizations were obtained in liquids containing dissolved paramagnetic material is described in this paper. The present paper, which is an extension of our earlier work, reports negative proton polarizations of up to about 150 in both naphthalene and anthracene free radical solutions.

Uppsala U. (Sweden).
BORIDES OF RHENIUM AND THE PLATINUM METALS. THE CRYSTAL STRUCTURE OF Re_7B_3,

ReB, Rh_7B_3, $RhB_{\sim 1.1}$, $IrB_{\sim 1.1}$, AND PtB, by B. Aronsson, E. Stenberg and J. Aselius. Technical note no. 8 on Contract AF 61(052)40. 15 Dec 59, 20p. 14 refs. AFOSR-TN-59-1138.
Order from LC mi$2.40, ph$3.30 PB 145 866

Re_7B_3 and Rh_7B_3 are isomorphous with Ru_7B_3 (Th_7Fe_3 ($D1_0$)-type). The structure of ReB_3 is closely related to those of Mo_2B_5 and W_2B_5. $RhB_{\sim 1.1}$ and PtB crystallize in the anti-NiAs structure, and a phase with the approximate composition $IrB_{\sim 1.1}$ is isomorphous with $ThSi_2$ (C_c-type).

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF Re_3B, by B. Aronsson, Maggie Bäckman and S. Rundqvist. Technical note no. 11 on Contract AF 61(052)40. 22 Jan 60, 10p. 9 refs. AFOSR-TN-59-1290.
Order from LC mi$1.80, ph$1.80 PB 145 859

The crystal structure of Re_3B has been determined by powder and single crystal methods.

Uppsala U. (Sweden).
X-RAY INVESTIGATION ON RHODIUM PHOSPHIDES. THE CRYSTAL STRUCTURE OF Rh_4P_3, by Stig Rundqvist and Allan Hede. Technical note no. 10 on Contract AF 61(052)40. 9 Jan 60, 18p. 20 refs. AFOSR-TN-59-1270.
Order from LC mi$2.40, ph$3.30 PB 145 860

The rhodium-phosphorus system has been investigated in the range 0-75 atom per cent phosphorus using X-ray and chemical analytical methods. Four intermediate phases have been found, viz. Rh_2P, Rh_4P_3, RhP_2 and RhP_3.

Willow Run Labs., U. of Michigan, Ann Arbor.
PHASE DIAGRAM FOR THE BINARY SYSTEM CdTe-In_2Te_3, by Lars Thomassen and Donald R. Mason. Rept. on Project Michigan, Contract DA 36-039-sc-78801. Apr 60, 27p. 16 refs. 2900-80-R.
Order from LC mi$2.70, ph$4.80 PB 146 869

The phase diagram for the binary system CdTe-In_2Te_3 has been obtained by correlating information from differential thermal analysis measurements, microscopic studies, diffusion couples, and X-ray powder patterns. In establishing the terminal points for this diagram, the melting point for In_2Te_3 was found to be 667 ± 1°C. For CdTe, a melting point of 1098±3°C was indicated. In going across the diagram, three peritectics are apparent. The first (β) is at 785°C and 50 mol % In_2Te_3; the second (γ) is at about 702°C and 74 mol % In_2Te_3; and the third (δ') is at 695°C and about 83 mol % In_2Te_3. There is a large retrograde solubility of $CdIn_2Te_4$ in CdTe. The δ-phase transforms to an ϵ-phase at 625°C and 100% In_2Te_3. The addition of CdTe stabilizes the δ-phase, and it finally disappears to $\gamma + \epsilon$ in a eutectoid reaction at about 360°C and 83 mol % In_2Te_3. Some of the properties of the phases have been measured and are presented. There appear to be qualitatively significant monotonic relationships among the energy gap, the transition temperatures, and the compositions. (Author)

Theoretical Physics

Aeronutronic, Newport Beach, Calif.
THEORETICAL STUDY OF HIGH TEMPERATURE EMISSIVITIES AND ATMOSPHERIC TRANSMISSION, by Gilbert N. Plass and V. Robert Stull. Final rept. on Contract AF 19(604)2166. 30 Jan 60, 88p. 17 refs. Aeronutronic U-784; AFCRC-TR-60-221.
Order from LC mi$4.80, ph$13.80 PB 145 869

A number of different topics have been investigated which are connected with the determination of the high temperature spectral emissivity of molecules and solid particles and with the transmission of infrared radiation through the atmosphere. Basic to all of these calculations was the development of new mathematical models to represent the absorption of an infrared band. These models materially reduce the amount of computation involved without sacrificing accuracy. They were used to calculate the spectral emissivity of carbon dioxide from 1800 to 2500 cm^{-1} and of hydrogen chloride from 1000 to 3400 cm^{-1}. The spectral emissivity of spherical carbon particles was also calculated up to 2400°K. New and more accurate calculations have been made of the atmospheric absorption of infrared radiation in the region of most of the important bands. (Author)

Applied Mathematics and Statistics Lab., Stanford U., Calif.
A CORNER EFFECT IN PLANE DIFFUSION THEORY, by Harold Levine. Technical rept. no. 83 on Contract Nonr-225 (11). 6 May 59, 34p. 5 refs. AD-216 413.
Order from LC mi$3.00, ph$6.30 PB 146 075

Some aspects of the mathematical technique are discussed with reference to plane problems where the boundaries are defined by straight lines. A different approach to the problem is considered which does not require series development and subsequent summation and is distinguished by a greater adaptability to the study of various aspects of the solution. The method rests on a pair of integral transform relations. A discussion is given of the local flux, or normal derivative, at the boundary with reference to the right angle corner. Its deviation from a constant value, reached at large distances from the corner, is characterized by an inhomogeneous integral equation with semi-infinite domain. The complex Fourier transform of this distribution satisfies a simple type of functional or difference relation, and is obtained by a further application of the same transformation. The normal derivative at the boundary is recalculated to illustrate a technique for employing an integral representation of the spatial function within the corner region.

Astro-Electronic Products Div., Radio Corp. of America, Princeton, N. J.
RESEARCH ON PLASMA ACCELERATION BY ELECTRIC FIELD GRADIENT. Semi-annual technical rept. for 30 June-31 Dec 59 on Contract AF 49(638)658. Dec 59, 74p. 26 refs. [AFOSR-TN-60-211; AD-232 096]
Order from LC mi$4.50, ph$12.30 PB 145 873

Theoretical and experimental studies of plasma acceleration by nonuniform RF fields are presented. Theoretical considerations indicate that a plasma will be accelerated toward the low-field region if the applied frequency is greater than the plasma frequency and toward the high-field region if the frequency is less than the plasma frequency. Pulses of mercury plasma have been generated in a reproducible way, and an RF system has been designed and operated. Phototubes and electron and ion pickup probes have been used for detecting the moving plasma. Oscillograms show a change in plasma velocity as the RF field is applied. (Author)

Avco-Everett Research Lab., Mass.
ON THE FLOW OF A VISCOUS ELECTRICALLY CONDUCTING FLUID, by Harvey P. Greenspan. Rept on Contract AF 49(638)61. Oct 59, 34p. 3 refs. Research rept. 73; AFOSR-TN-59-1221; AD-231 877.
Order from LC mi$3.00, ph$6.30 PB 145 772

Magnetohydrodynamic flow of a viscous incompressible fluid of constant properties past a flat plate is considered. The applied magnetic field is parallel to the free stream direction and the plate is at zero angle of attack. A number of explicit solutions of the linearized theory are presented for the flow past a semi-infinite plate which is either sucking or injecting a conducting fluid into the main stream. The sub-Alfven flow past a long finite impermeable plate is studied in some detail and the magnitude of the viscous wake is compared to the similar type upstream disturbance produced by the forward propagation of Alfven waves.

Brandeis U., Waltham, Mass.
ON A QUANTUM MECHANICAL THEORY OF ABSOLUTE REACTION RATES, by Sidney Golden. Technical rept. no. 6 on Contract Nonr-1677(01). 1 Apr 59, 57p. 22 refs.
Order from LC mi$3.60, ph$9.30 PB 145 810

The criteria employed for classifying a collection of electrons and nuclei as some particular set of chemical species or another are embodied in the form of projection operators, here termed species-classification operators. Logical properties or reproducibility, distinguishability and completeness are imposed upon the several species-classification operators for a system. The effect of different criteria of species classification upon the kinetic equations is discussed in relation to current theories of absolute reaction rates. (See also PB 140 966)

Cornell U., Ithaca, N. Y.
DIFFUSION AND DESORPTION OF METAL IMPURITIES IN PLATINUM, by Richard C. Bradley. Technical rept. no. 13 on Contract AF 18(600)674. 1 Oct 59, 18p. 18 refs. AFOSR-TN-59-1004.
Order from LC mi$2.40, ph$3.30 PB 145 868

Activation energies for the volume diffusion of impurities in polycrystalline platinum samples have been obtained by studying the ions released at temperatures above 1000°C.

Electron Tube and Microwave Lab., Calif. Inst. of Tech., Pasadena.
EXPERIMENTS ON THE INTERACTION OF A MODULATED ELECTRON BEAM WITH A PLASMA, by Gary D. Boyd. Technical rept. no. 11 on Contract Nonr-220(13). May 59, 111p. 55 refs.
Order from LC mi$6.00, ph$18.30 PB 145 902

New experiments are performed concerning the high frequency interactions of electron beams and plasmas. In the course of verifying plasma density measurements, the excitation of the dipole resonance of a plasma column is considered. Multiple resonances are observed and discussed.

Plasma Propulsion Lab., Republic Aviation Corp., Farmingdale, N. Y.
EXPERIMENTAL INVESTIGATIONS OF ELECTROMAGNETICALLY INDUCED DETONATIONS. PART I. PARAMETERS AFFECTING THE FORMATION OF THE PINCH, by Thomas Donner and Leonard Aronowitz. Rept. on Contract AF 49(638)552. Nov 59, 35p. 4 refs. PPL rept. no. 122. AFOSR-TN-60-59.
Order from LC mi$3.00, ph$6.30 PB 145 843

A series of tests were conducted with various gases to investigate the conditions needed for the formation of the "pinch discharge". Most tests were conducted at capacitor energies somewhat below those under which pinches had been previously obtained. Some tests were made with mixtures of H_2 and O_2 as a first attempt to obtain pinch induced detonations.

Plasma Propulsion Lab., Republic Aviation Corp., Farmingdale, N. Y.
THEORETICAL STUDIES FOR A PROBLEM IN ELECTROMAGNETICALLY INDUCED DETONATIONS, by W. Chinitz, K. M. Foreman, and L. W. Levin. Rept. on Contract AF 49(638)552. 30 Nov 59, 87p. 15 refs. PPL rept. no. 121; AFOSR-TN-60-85.
Order from LC mi$4.80, ph$13.80 PB 145 842

The aerothermochemistry of electromagnetically driven gaseous detonations is formulated. Next, the revisions necessary to transpose to a moving forced detonation, supported by a magnetic piston, are detailed. The numerical approximation techniques to permit programming for automatic digital computers are discussed. A method of computing enthalpy, heat of formation and equilibrium constant from available data is outlined. Quantities are tabulated for 16 reactions, involving hydrogen, oxygen, nitrogen, and argon, between temperatures of 100° to 24,000°K. The results of a parametric study of standing oxy-hydrogen and air-hydrogen detonations are graphically presented and discussed.

Stevens Inst. of Tech., Hoboken, N. J.
INVESTIGATION ON THE MANY BODY PROBLEM, by Jerome K. Percus. Final rept. on Contract Nonr-263(11). [1959] 14p.
Order from LC mi$2.40, ph$3.30 PB 145 996

Summaries are presented of: "dynamical" Lagrangian; statistical approach to the domain of action of collective co-ordinates; analysis of classical statistical mechanics by means of collective coordinates; role of quantum statistics in the collective approach; collective coordinate analysis of free Einstein-Bose system; the ground state of an Einstein-Bose system; comments on Bohm's new theory of superfluid helium II; some remarks on the role of supplementary variables in the collective treatment of the many body problem; generalized collective coordinates; some new kinds of collective coordinates; normal modes of oscillation at low density; collective modes of oscillation at high density; transverse collective coordinates; generation of action-angle variables; interpolation method; the equation of state for classical statistics; and the semiclassical approach.

Thermodynamics

Air Force Missile Development Center, Holloman AFB, N. Mex.
WIND EXCITED RIGID-BODY VIBRATIONS OF THE HELIOSTAT MIRROR FOR THE PROPOSED DEPARTMENT OF DEFENSE SOLAR FURNACE, by Sigurd Hoyer (Potter Instrument Co.). Jan 60, 54p. 5 refs. AFMDC-TN-60-1.
Order from LC mi$3.60, ph$9.30 PB 145 738

Rigid-body vibrations of the heliostat mirror is the subject of the present report. A minimum requirement is that the mirror be designed to withstand the static load produced by the worst possible wind condition. It is pointed out that the mirror may fail, even if this requirement is satisfied. Such failure may occur if the mirror is excited at one of its natural frequencies, or if the mirror is dynamically unstable in any possible wind condition. Von Kármán vortices may conceivably excite the mirror at one of its natural frequencies. Calculations presented here indicate that this should not prove to be a dangerous source of excitation. It is shown that one must investigate the dynamic stability of the mirror considered as a rigid body. Furthermore, it is shown that in order to do this, one must consider at least three coupled modes of vibration simultaneously.

Avco-[Everett] Research Lab., Mass.
HYPERSONIC GAS DYNAMIC CHARTS FOR EQUILIBRIUM AIR, by Saul Feldman. Rept. on Contract AF 04(645)18. Jan 57, 137p. 6 refs. Research rept. 40
Order from LC mi$6.90, ph$21.30 PB 146 700

A collection of charts is presented for the equilibrium properties of air in several flow situations of interest in hypersonic flow. The cases considered are: (a) flow over bodies in flight at hypersonic speeds: normal and oblique shocks; (b) flow over bodies in shock tubes: this includes moving, standing and reflected normal shocks as well as oblique shocks. A Mollier diagram is also included. (Author)

Avco [Everett] Research Lab., [Mass.]
RELAXATION PHENOMENA IN AIR BETWEEN 3000 AND 8000°K, by M. Camac, J. Keck, and C. Petty. Rept. on Contract AF 04(645)18. 13 Mar 58, 32p. 9 refs. Research rept. 22.
Order from LC mi$3.00, ph$6.30 PB 146 853

Experimental data on the time dependence of the molecular oxygen concentration and the emitted radiation behind moving shock waves in air have been obtained which may be applied directly to practical aerodynamic problems or interpreted to give basic information about reaction kinetics. Since the reaction kinetics of air are not at all well understood at present and are probably quite complicated, extreme caution is urged in extrapolating the information given to conditions which differ markedly from those of the experiments.

General Electric Co. [Schenectady, N. Y.]
TEMPERATURE-ALTITUDE TEST OF MODEL II FIN SERVO AMPLIFIER WITH DOUBLE LAMINATE MOUNTING BOARD, by E. C. Fehner. 16 Oct 52, declassified, 4p. Hermes Heat Transfer memo. no. 55.
Order from LC mi$1.80, ph$1.80 PB 145 916

General Mills, Inc., Minneapolis, Minn.
RESEARCH ON THE EFFECTS OF COLLISIONS OF SMALL PARTICLES WITH BODIES MOVING AT HYPERSONIC SPEED. PART II. EROSION AND HEAT TRANSFER EFFECTS, by G. Whitnah, G. Wehner and others. Rept. for 15 Sep 58-15 July 59 on Contract AF 33(616)5565. Aug 59, 110p. 4 refs. WADC Technical rept. 58-498, Pt. 2.
Order from OTS $2.50 PB 161 657

Results of experimental work in the investigation of heat transfer to smooth and roughened nose cone models are discussed. Heat transfer coefficients for models roughened by sandblasting and by etching are compared with those of smooth models for the two stagnation pressures investigated. Large increases in average heat transfer coefficients were found for the roughened models. Locations of maximum heat transfer were measured for both roughened and smooth models and were found to be considerably closer to the stagnation point for the roughened models than for the smooth model. The experimental apparatus and techniques employed in these investigations are described. Surface pitting or roughening due to the formation of binary and ternary alloys at elevated temperatures has been studied further. Recent data on hypervelocity cratering are discussed. A mathematical analysis of the dispersion of particles by explosive means and as a result of wind shear forces has been made.

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
IMPACT PRESSURE AND TOTAL TEMPERATURE INTERPRETATION AT HYPERSONIC MACH NUMBER, by J. C. Graves and N. R. Quiel. Rept. on Hypersonic Research Project, Contract DA 04-495-ORD-19. 26 July 54, 66p. 18 refs. Memo. no. 20.
Order from LC mi$3.90, ph$10.80 PB 146 701

Results are presented of an experimental investigation of impact-pressure and total-temperature interpretation at a nominal Mach number of 5.6. The data indicate that the Rayleigh equation, which assumes non-viscous flow, requires correction at low free-stream Reynolds numbers. These viscous effects are detected at Reynolds numbers (based on impact-probe diameter) as high as 6000, and they continue to increase with decreasing Reynolds numbers. At the low pressure limit of the facilities used in this investigation, the maximum viscous correction is 2.5 per cent for a Reynolds number of 425.

Institute of Engineering Research, U. of California, Berkeley.
HEAT TRANSFER, RECOVERY FACTOR AND PRESSURE DISTRIBUTIONS AROUND A CIRCULAR CYLINDER NORMAL TO A SUPERSONIC RAREFIED AIR STREAM. PART II: COMPARISON OF EXPERIMENT WITH THEORY, by Omar El-Khattab Tewfik. Doctoral thesis. Rept. on Contract Nonr-222(45). 15 May 59, 75p. 18 refs. HE-150-169; Series no. 20, issue no. 128; AD-217 961.
Order from LC mi$4.50, ph$12.30 PB 146 027

Theoretical methods for the prediction of heat transfer, recovery factor and pressure distributions around a circular cylinder normal to a supersonic rarefied gas stream are critically evaluated by comparison with experimental measurements. The results of extensive measurements of heat transfer, recovery factor and pressure distributions obtained in the low pressure wind tunnel of the University of California are reported. Interpretation of these results involved essentially the analysis of heat transfer from a laminar compressible boundary layer with pressure gradient and provides an excellent criterion for a critical study and evaluation of pertinent theory. The modified Newtonian theory was compared with the results of pressure distribution measurements in the Mach number range 3.55 - 5.73, and the Reynolds number range 330 - 4100, using an adiabatic and a cooled model. The free stream was rarefied, with its density corresponding to that of the atmosphere at about a 30-40 mile altitude. (Author) (See also PB 145 090)

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A METHOD OF DETERMINING THE THERMAL CONDUCTIVITY, ELECTRICAL RESISTIVITY, AND TOTAL AND SPECTRAL EMISSIVITY OF A CONDUCTING MATERIAL AT HIGH TEMPERATURE FROM ELECTRICAL AND THERMO-OPTICAL MEASUREMENTS ON A HEATED TUBE IN A VACUUM, by Walter B. Powell. Rept. on Contract DA 04-495-ORD-18. 5 July 57, 21p. 1 ref. Progress rept. no. 20-324; AD-151 861.
Order from LC mi$2.70, ph$4.80 PB 146 369

A method of determining the thermal conductivity and electrical resistivity of a conducting material, as functions of temperature, from electrical and thermal measurements on a heated tube is described. This method takes into account linear gradients of these physical properties with temperature. A separate calculation procedure, to be employed when an optical pyrometer is used to observe the tube surfaces, makes it possible to determine the total and spectral emissivity, as well as the true temperature. (Author)

Leyden U. (Netherlands).
ENTROPY AND GAUSSIAN-MARKOFF PROCESSES, by P. Mazur and S. R. de Groot. Technical note on Contract AF 61(052)16. 16 July 59, 17p. 1 ref. AFOSR-TN-59-960; AD-226 408.
Order from LC mi$2.40, ph$3.30 PB 146 020

The model of Gaussian-Markoff processes is used to discuss the time behavior of entropy. The statistical definitions of entropy of Boltzmann and Gibbs are considered. Under macroscopic conditions, the same behavior as expected from non-equilibrium thermodynamics is shown to be obtained in both cases. (Author)

Naval Research Lab., U. of Wisconsin, Madison.
THE INITIAL PRESSURE DEPENDENCE OF THERMAL CONDUCTIVITY AND VISCOSITY, by Daniel E. Stogryn and Joseph O. Hirschfelder. Rept. on Contract N7onr-285(11). 13 Apr 59, 35p. 21 refs. WIS-ONR-36.
Order from LC mi$3.00, ph$6.30 PB 145 889

The initial pressure dependence of thermal conductivity and viscosity of gases is considered to arise from (1) molecular association and (2) collisional transfer. Clusters larger than dimers can be neglected. In the case of thermal conductivity, it is found that at low temperatures molecular association is more important than collisional transfer while at high temperatures collisional transfer predominates. For viscosity, the initial pressure dependence is due primarily to collisional transfer. Detailed equations are given for both of these effects.

Purdue U. Div. of Engineering Sciences, Lafayette, Ind.
IRREVERSIBLE THERMODYNAMICS AND CONTINUUM MECHANICS, by A. Cemal Eringen. Technical rept. no. 14 on Contract Nonr-1100(02). May 59, 33p. 17 refs.
Order from LC mi$3.00, ph$6.30 PB 145 900

Principles of the irreversible thermodynamics are recapitulated. Using the basic conservation principles and the principles of irreversible thermodynamics, the fundamental equations and constitutive relations are obtained for fluids, solids, and visco-elastic media. Equations for the entropy production and heat conduction are derived for various special media and for a general medium having internal constraints. For the latter case, a law generalizing Fourier's law of heat conduction is found. (Author)

Wave Propagation

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STUDIES OF METEOR-BURST PROPAGATION AT 49 AND 74 MEGACYCLES, by M. L. Meeks,

J. C. James and others. Final rept. for 1 Jan 56-30 June 58 on Contract AF 19(604)1593. [1958] 70p. 11 refs. AFCRC-TR-58-178; AD-160 821.
Order from LC mi$3.90, ph$10.80 PB 137 438

Signals transmitted from Walpole, Massachusetts, on 49.44 mc and 73.82 mc were received at Congaree, South Carolina, (path length 1250 km) and at Smyrna, Georgia, (path length 1480 km). Five-element Yagi antennas were used, and the output power was 5 kw on 49 mc and 3 kw on 74 mc. The duty cycle was found to be 2 or 3 times greater at 49 mc during the night, but during the day - particularly around noon - the duty cycle became about equal because of ionospheric-scatter noise at 49 mc. Diurnal variations in meteor burst rates on both frequencies show good agreement with the theoretical predictions of James and Meeks. Over flat terrain at Congaree there was no significant change in meteor-burst rate with antenna height for heights ranging from 1.65 λ to 6.34 λ. However, strong decorrelations were found between the burst amplitudes observed at markedly different antenna heights. Strong correlation was observed between underdense bursts observed with two antennas at the same height above ground but with various lateral separations extending out to 662 ft at Congaree. Overdense bursts, however, frequently showed decorrelations. Close agreement was found between the burst rates observed simultaneously at Congaree (flat terrain) and at Smyrna (hilly terrain). In the terrain at Smyrna bursts from two antenna at the same height above sea level were well correlated. (Author)

National Bureau of Standards, Boulder, Colo.
REPORT ON THE IGY OBLIQUE-INCIDENCE SPORADIC-E AND F-SCATTER PROGRAM, by J. W. Finney and E. K. Smith, Jr. Final rept. on National Science Foundation Grant no. Y/6.14/120 and Technical rept. no. 1 on NSF Grant no. Y/22.7/328. Mar 60, 101p. 4 refs. Technical note no. 48.
Order from OTS $2.50 PB 151 407

The existence of the longitude effect in the occurrence of sporadic-E propagation suggested by previous data has been affirmed by this experiment, inasmuch as three to five times more sporadic E (depending on the reference level) has been observed on the Poro-to-Onna circuit in the Far East than on the Panama-to-Cuba circuit in the Caribbean. Seasonal variations of the occurrence of sporadic E showed the summer maximum on both circuits, but only the Far East one had a well defined winter peak. Diurnally, sporadic E recorded over the Poro-to-Onna circuit exhibited a double-peaked daytime maximum, with the peaks occurring at 1000 and 1700 hours. The Es data from the Panama-to-Cuba circuit also had the daytime maximum but only one peak in the afternoon. Peculiar evening signal enhancements (referred to as the evening signal anomaly or Far East anomaly) have been observed, particularly around the fall equinox, over the Poro-to-Onna circuit.

National Bureau of Standards, Boulder, Colo.
A SUMMARY OF VHF AND UHF TROPOSPHERIC TRANSMISSION LOSS DATA AND THEIR LONG-TERM VARIABILITY, by D. A. Williamson, V. L. Fuller and others. Mar 60, 183p. 2 refs. Technical note no. 43.
Order from OTS $2.25 PB 151 402

Cumulative distributions of hourly median basic transmission loss are presented for 135 beyond-line-of-sight radio paths in the United States. In order to allow for seasonal trends of transmission loss, the year is divided into a summer period, May through October, and a winter period, November through April. The long-term variability of observed hourly medians is compared with predicted variability based on empirical curves by Rice, Longley and Norton. (PB 151 374). (Author)

Stanford Electronics Lab., Stanford U., Calif.
OBLIQUE ECHOES FROM OVER-DENSE METEOR TRAILS, by L. A. Manning. Technical rept. no. 29 on Contract Nonr-225(24). 28 Feb 58, 23p. 8 refs. AD-157 095.
Order from LC mi$2.70, ph$4.80 PB 138 142

Ray paths are computed for waves refracted by meteor trails having a Gaussian radial distribution of ionization density.

Stanford Research Inst., Menlo Park, Calif.
COMPUTATION OF WHISTLER RAY PATHS, by Irving Yabroff. Final letter rept, pt. 2 on Contract AF 18(603)126. Dec 59, 52p. 3 refs. AFOSR-TN-60-71.
Order from LC mi$3.60, ph$9.30 PB 145 865

This is the second of two reports covering the work done on the theory and application of ray tracing techniques to whistler propagation in the outer ionosphere. The work reported here is an attempt to demonstrate some of the complex phenomena of "magneto-ionic duct" propagation. (See also PB 145 864).

Stanford Research Inst., Menlo Park, Calif.
THE THEORY OF PROPAGATION OF RAYS IN AN INHOMOGENEOUS AND ANISOTROPIC MEDIUM, by J. J. Bandstatter. Final letter rept., pt. 1 on Contract AF 18(603)126. Dec 59, 66p. 7 refs. AFOSR-TN-60-138.
Order from LC mi$3.90, ph$10.80 PB 145 864

This is the first of two reports covering the work done on the theory and application of ray tracing techniques to whistler propagation in the outer ionosphere. This report provides an exposition of the background theory in a more geometric setting.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Army Research Office, Washington, D. C.
ANNUAL RESEARCH TASK SUMMARY, 1960. VOLUME 7. INDEX. 677p.
Order from OTS $3.00 PB 161 139

Contents:
Sect. 1. Project numbers, project titles, and task titles
Sect. 2. Location of work: Army installations, other government installations, roster of contractors doing external work
Sect. 3. Chief investigators
Sect. 4. Scientific fields and sub-fields
Sect. 5. Subject index
(See also PB 161 133-PB 161 138)

Case Inst. of Tech., Cleveland, Ohio.
A NUCLEAR MAGNETIC RESONANCE SPECTROMETER, by Perry R. Longaker. Master's thesis. Technical rept. no. 1 on Contract Nonr-1141(07). May 59, 54p. 11 refs. AD-229 366.
Order from LC mi$3.60, ph$9.30 PB 145 931

The construction of a Pound type nuclear magnetic resonance absorption spectrometer patterned after the Nuclear Magnetics Corporation design is described. Calibration and operation procedures at radio frequency fields of 1 to 30 mc and magnetic fields of about 7500 gauss are discussed, utilizing proton resonance in mineral oil and the lithium resonance in various compounds. (Author)

Ohio State U. Research Foundation, Columbus.
THE EFFECT OF AUDITORY STIMULATION ON THE PRONUNCIATION OF ENGLISH WORDS BY NON-NATIVE SPEAKERS, by Henry M. Moser, Herbert J. Oyer and others. Technical rept. no. 54 on Contract AF 19(604)4575. Sep 59, 21p. 12 refs. AFCRC-TN-59-56.
Order from LC mi$2.70, ph$4.80 PB 146 218

On the basis of experimental evidence presented, it is concluded that: (1) Auditory stimulation improves the intelligibility of the pronunciation of English words by foreign nationals. (2) The most frequent distortions that occurred for the vocabulary under study involved vowel distortions. (3) Auditory stimulation may have an adverse effect upon some words. However, there was no set pattern of distortion in terms of vowel, consonant, or inflectional distortion. Adverse effect is probably due to chance.

Willow Run Labs., U. of Michigan, Ann Arbor.
SURVEY OF AUTOMATA THEORY, by John Holland. Memo. on Proj. Michigan, Contract DA 36-039-sc-78801. Sep 59, 25p. 26 refs. Memo. no. 2900-52-R; AD-226 595.
Order from LC mi$2.70, ph$4.80 PB 145 992

Automata theory draws its methods and data from several disciplines. Major contributions of 4 disciplines, and the way in which these contributions are integrated to form a unified discipline, are surveyed here. The 4 disciplines are : (1) logic and metamathematics, (2) the theory and use of stored-program computing machines, (3) information theory, and (4) neurophysiology and related parts of psychology. From logic and metamathematics come the concepts of a formal system (the axiomatic method and decision procedures), general recursive functions (effective definition), and Turing machines (computability). Study of stored-program computers contributes the concepts of the logical net, programming, and simulation. Information theory provides a means of studying complex systems by statistical methods, giving a measure of the amount of data a system can process or store, and rigorous definitions to concepts such as redundancy and feedback. Finally, neurophysiology and psychology supply data and examples of very complex systems, important questions, and some suggestive outlines of theory. Consideration is given to the way in which these methods and concepts are coordinated to provide abstract deductive theories of complex systems with delayed feedback. (Author)

SOCIAL SCIENCES

Stanford U., Calif.
LOANABLE FUNDS VERSUS LIQUIDITY PREFERENCE THEORIES OF INTEREST, by Takashi Negishi. Technical rept. no. 74 on Contract N6onr-25133. 30 Apr 59, 13p. 11 refs.
Order from LC mi$2.40, ph$3.30 PB 145 945

If we introduce money and credit in the general economic equilibrium model, we must decide between two alternative theories of the rate of interest, the Loanable Funds Theory, and the Liquidity Preference Theory. Here we confine ourselves to the merits and demerits of these two theories in relation to the tâtonnement the dynamic adjustment within a Hicksian week, and understand that the Loanable Funds Theory insists that the dynamic movement of the rate of interest is determined by the excess demand which exists in the loan market, while the Liquidity Preference Theory maintains the determination of the dynamic path of the rate of interest by the excess demand which exists in the money market.

Documentation

Armed Services Technical Information Agency, Arlington, Va.
THESAURUS OF ASTIA DESCRIPTORS, FIRST EDITION, by J. Heston Heald, Herbert Rehbock and others. 329p. AD-235 000.
Order from OTS $5.00 PB 161 681

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Patent Office, Washington, D. C.
ADVANCES IN MECHANIZATION OF PATENT SEARCHING; CHEMICAL FIELD, by B. E. Lanham, J. Leibowitz, and H. R. Koller. 11 Apr 56, 11p. 3 refs. Research and Development repts. no. 2.
Order from LC mi$2.40, ph$3.30 PB 146 067

Patent Office, Washington, D. C.
A FIRST APPROACH TO PATENT SEARCHING PROCEDURES ON STANDARDS ELECTRONIC AUTOMATIC COMPUTER (SEAC) by Ethel C. Marden (National Bureau of Standards), Harold Pfeffer, and Herbert R. Koller. 28 Jan 58, 22p. 3 refs. Research and Development repts. no. 10.
Order from LC mi$2.70, ph$4.80 PB 146 073

Patent Office, Washington, D. C.
INTERRELATED LOGIC ACCUMULATING SCANNER (ILAS), by Don D. Andrews. 25 June 57, 17p. 1 ref. Research and Development repts. no. 6.
Order from LC mi$2.40, ph$3.30 PB 146 070

Patent Office, Washington, D. C.
ORGANIZATION OF CHEMICAL DISCLOSURES FOR MECHANIZED RETRIEVAL, by B. E. Lanham, J. Liebowitz and others. 14 June 57, 12p. 2 refs. Research and Development repts. no. 5.
Order from LC mi$2.40, ph$3.30 PB 146 069

Patent Office, Washington, D. C.
A PUNCHED CARD SYSTEM FOR SEARCHING STEROID COMPOUNDS, by Julius Frome and Jacob Leibowitz. 8 July 57, 12p. Research and Development repts. no. 7.
Order from LC mi$2.40, ph$3.30 PB 146 071

Patent Office, Washington, D. C.
RECENT ADVANCES IN PATENT OFFICE SEARCHING: STEROID COMPOUNDS AND ILAS, by Julius Frome, H. R. Koller and others. Rept. of presentation made at Western Reserve University Symposium for Systems on Information Retrieval held in Cleveland, Ohio, April 15-17, 1957. 14p. 1 ref. Research and Development repts. no. 8.
Order from LC mi$2.40, ph$3.30 PB 146 072

Patent Office, Washington, D. C.
STORAGE AND RETRIEVAL OF CONTENTS OF TECHNICAL LITERATURE; NONCHEMICAL INFORMATION, by Don D. Andrews and Simon M. Newman. 15 May 56, 13p. 4 refs. Research and Development repts. no. 1.
Order from LC mi$2.40, ph$3.30 PB 146 066

Patent Office, Washington, D. C.
STORAGE AND RETRIEVAL OF CONTENTS OF TECHNICAL LITERATURE; NONCHEMICAL INFORMATION, by Simon M. Newman. June 57, 15p. 5 refs. Research and Development repts no. 4.
Order from LCmi$2.40, ph$3.30 PB 146 068

MISCELLANEOUS

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS, May 60.
Order from OTS $1.25, $10.00/year PB 161 281

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Magnetic compression of plasmas, by A. C. Kolb
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Problem notes
Applications Research: Formula for computing probability of success in war games and other competitive situations
Astronomy and Astrophysics: New extreme ultraviolet solar spectra
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Metallurgy and Ceramics: Development of nonembrittling cadmium-electroplating solutions. Brillouin zone studies of ternary magnesium alloys. Effect of neutron irradiation on the Charpy V and drop-weight test transition temperatures of various steels and weld metals. Explosion bulge test performance of experimental submerged arc weldments of HY-80 steel. Effect of pH on the rate of corrosion of mild steel at 800°F (316°C)
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General

Sizes of U. S. Steam-Electric Plants, by R. C. Robertson. Oak Ridge National Lab., Oak Ridge, Tenn. May 59. Contract W-7405-eng-26. 15p. Order from LC. Mi $2.40, ph $3.30.
CF-59-5-130

Decontamination of dissolver vent gases at Hanford, by A. G. Blasewitz and others. Hanford Works, Richland, Wash. Feb 51. Decl. July 6, 1959. Contract W-31-109-Eng-52. 17p. Order from LC. Mi $2.40, ph $3.30. HW-20332

Unclassified research and development programs executed for the Division of Reactor Development and the Division of Research, September 1959, by L. H. McEwen, comp. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Oct 59. Contract AT(45-1)-1350. 42p. Order from LC. Mi $3.30, ph $7.80.
HW-62362

A method of calculating boundary-layer thickness in axisymmetric nozzles with laminar hypersonic flow, by A. F. Johnson. Sandia Corporation, Albuquerque, N. Mex. Oct 59. 26p. Order from OTS. 75 cents. SC-4370(RR)

Civilian application releases through 1959. Sandia Corporation Bibliography, by the Technical Information Division. Sandia Corporation, Albuquerque, N. Mex. Jan 60. 87p. Order from OTS. $2.25. SCR-150

Report number series, used by the Technical Information Service in cataloging reports, by F. E. Stratton. Oak Ridge National Laboratory, Technical Information Service Extension, Oak Ridge, Tenn. Mar 60. 116p. Order from OTS. $2.75.
TID-85 (2nd Rev.)

Biology and Medicine

Uptake of radioisotopes and their transfer through food chains by marine organisms. Annual report 1958-1959, by S. J. Townsley and others. Univ. of Hawaii. Hawaii Marine Lab., Honolulu, Hawaii. Contract AT(04-3)-56. 47p. Order from LC. Mi $3.30, ph $7.80. AECU-4350

Tunover of labeled amino acids and proteins in cancerous tissues and mammals. Literature search, by M. Comstock. Brookhaven National Lab., Upton, N. Y. Oct 58. 5p. Order from LC. Mi $1.80, ph $1.80. AECU-4357

Effect of proton and dueteron irradiation on biolo-ical material. Bibliography, by M. Comstock. Brookhaven National Lab., Upton, N. Y. Sep 58. 2p. Order from LC. Mi $1.80, ph $1.80.
AECU-4358

Respiratory pathways in fungi and actinomycetes. Final report for January 1, 1956 to June 30, 1959, by V. W. Cochrane. Wesleyan Univ., Middletown, Conn. Sep 59. Contract AT(30-1)-1813. 29p. Order from LC. Mi $2.70, ph $4.80.
AECU-4366

Studies of the effects of ionizing radiation on the ultrastructure of developing nervous tissue as revealed by electron microscopy. Annual report for November 1, 1958, to October 31, 1959, by H. Fernandez-Moran. Massachusetts. General Hospital. Mixter Labs. for Electron Microscopy, Boston, Mass. 1959. Contract AT(30-1)-2278. 36p. Order from LC. Mi $3.00, ph $6.30.
AECU-4405

Study of long-term pathologic effects of radioactive isotopes of calcoum and strontium in bone and soft tissues, especially with reference to bone tumor production. Final technical report for

May 16, 1958 to August 31, 1959, by J. F. Kuzma and G. E. Zander-Principati. Marquette Univ., School of Medicine, Milwaukee, Wis. 1959. Contract AT(11-1)-105. 63p. Order from LC. Mi $3.90, ph $10.80. AECU-4409

Final report. Atomic Energy Commission Contract AT(11-1)-194. Chicago Medical School, Chicago, Ill. 1959. 5p. Order from LC. Mi $1.80, ph $1.80. AECU-4432

Final report [on effects of radiation on apples and grapes], by C. Pratt. New York State Agricultural Experiment Station, Geneva, N. Y. [1959]. Contract AT(30-1)-1541. 3p. Order from LC. Mi $1.80, ph $1.80. AECU-4475

Biological and Medical Research Division semiannual report, January through June, 1958, by L. R. Drapper and others. Argonne National Laboratory, Lemont, Ill. Sep 58. Contract W-31-109-eng-38. 152p. Order from OTS. $3.00. ANL-5916

Structure and function of genetic elements. Brookhaven Symposia in Biology. No. 12, held June 1-3, 1959, by M. Levine and others. Brookhaven National Laboratory, Biology Dept., Upton, N. Y. 1959. 187p. Order from OTS. $2.00. BNL-558 (C-29)

Radiosensitivity of various species of bacteria under different environmental conditions. Final report for the period December 15, 1958 to August 31, 1959, by B. E. Proctor and others. Massachusetts Inst. of Tech., Cambridge, Mass. 1959. Contract AT(30-1)-1719. 22p. Order from LC. Mi $2.70, ph $4.80. NYO-2861

Radiation background in albuquerque, New Mexico, during and after the teapot series, by H. H. Sanders and T. B. Cook, Jr. Sandia Corp., Albuquerque, N. Mex. Sep 55. 12p. Order from LC. Mi $2.40, ph $3.30. SCTM-206-55-(51)

The chemical, physical, and biological properties of human serum phospholipides. Thesis, by G. J. Nelson. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. Jan 60. Contract W-7405-eng-48. 76p. Order from OTS. $2.00. UCRL-9040

Biological mixtures, some biophysical problems, and the stable-flow free-boundary method, by H. C. Mel. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. Feb 60. Contract W-7405-eng-48. 36p. Order from OTS. $1.00. UCRL-9108

Chemistry—General

Separation factor and transfer coefficients associated with ion exchange separation of enriched as-depleted As, by S. H. Jury. Oak Ridge National Lab., Oak Ridge, Tenn. Aug 52. Decl. December 17, 1958. Contract W-7405-eng-26. 14p. Order from LC. Mi $2.40, ph $3.30. CF-52-8-218

Equilibrium concentrations of several gaseous species (CO, CO_2, CH_4, H_2, H_2O) in equilibrium with graphite at very low hydrogen and oxygen levels, by D. V. Ragone. General Dynamics Corp., Dept. of Chemical and Metallurgical Engineering, Univ. of Michigan, Ann Arbor, Mich. Mar 60. Contract AT(04-3)-187. 15p. Order from OTS. 50 cents. GA-1109

A study of the Miller's fluorinated lubricant - chlorine trifluoride reactions, by G. Stern and R. P. Bell. Goodye r Atomic Corp., Tech. Div., Process Engineering Dept., Portsmouth, Ohio. Jan 60. Contract AT(33-2)-1. 22p. Order from OTS. 75 cents. GAT-290

Infrared spectra of ClO_2, ClO_2F, and ClO_3F, by E. A. Smith and tohers. Goodyear Atomic Corp Portsmouth, Ohio. Oct 59. Contract AT(33-2)-1. 6p. Order from LC. Mi $1.80, ph $1.80. FAT-T-687

The melting points of uranium dioxide, uranium monocarbide, and uranium mononitride, by H. W. Newkirk and J. L. Bates. General Electric Co., Hanford Atomic Products Operation, Richland, Wash. Mar 59. 5p. Order from LC. Mi $1.80, ph $1.80. HW-59468

Decontamination studies for HAPO high temperature reactor recirculation systems. Progress report for June 1958 to June 1959, by L. D. Perrigo and R. D. Weed. General Electric Co., Hanford Atomic Products Operation, Richland, Wash. June 59. Contract W-31-109-Eng-52. 34p. Order from LC. Mi $3.00, ph $6.30. HW-60677

Exchange studies of the uranium-tributyl phosphate reaction, by B. Keisch. Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho. Nov 59. Contract AT(10-1)-205. 23p. Order from LC. Mi $2.40, ph $3.30. IDO-14490

Measurement error - identification and estimation, by F. H. Tingey. Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

Mar 60. Contract AT(10-1)-205. 21p. Order from OTS. 75 cents. IDO-14508

Process of the storage of plutonium hexafluoride, by N. J. Hawkins Knolls Atomic Power Lab., Schenectady, N. Y [1957] Decl. Oct 15, 1959 Contract W-31-109-eng-52. 9p. Order from LC. Mi $1.80, ph $1.80. KAPL-M-NJH-2

The reliability of determining impurity titanium in Zircaloy, by W. S. Horton. Knolls Atomic Power Lab., Schenectady, N. Y. Dec 59. Contract W-31-109-Eng-52. 20p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-WSH-5

Estimated upper bounds to the half-life of thermal decomposition of ammonia, hydrogen, methane, and propane, by D. Herschbach Los Alamos Scientific Lab., N. Mex. Aug 56. Decl. Aug 11, 1959. Contract W-7405-eng-36. 30p. Order from LC. Mi $2.70, ph $4.80. LAMS-1954

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Space groups and atomic parameters in some graphite-alkali metal lamellar compounds, by G. M. Wolten. Atomics Interantional. A Division of North American Aviation, Inc., Canoga Park, Calif. Apr 60. Contract AT(11-1)-GEN-8. 18p. Order from OTS. 75 cents NAA-SR-4545

Solubility of terphenyls at room temperature, by R. T. Keen. Atomics International Division., North American Aviation, Inc., Canoga Park, Calif. Jan 58. 4p. Order from LC. Mi $1.80, ph $1.80. NAA-SR-Memo-2412

Thermo-physical properties of OMRE circulating coolant, by G. Asanovich. Atomics International Div., North American Aviation, Inc., Canoga Park, Calif. May 59. 16p. Order from LC. Mi $2.40, ph $3.30. NAA-SR-Memo-3843

Thermodynamic properties of sulfuryl fluoride from 12°K to its boiling point. The entropy from molecular and spectroscopic data, by F. J. Bockhoff and others. Western Reserve Univ., Morley Chemical Lab., Cleveland, Ohio. Sep 59. Contract AT(30-1)-824. 23p. Order from LC. Mi $2.70, ph $4.80. NYO-4885

The system lithium hydride--calcium hydride, by C. E. Messer. Tufts Univ., Medford, Mass. Sep 59. Contract AT(30-1)-1410. 12p. Order from LC. Mi $2.40, ph $3.30. NYO-8026

Calculation of suspension peptization, by F. H. Sweeton. Oak Ridge National Lab., Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 131p. Order from OTS. $2.75. ORNL-2791

Reduction of cupric oxide by hydrogen. I Fundamental kinetics, by W. D. Bond and others. Oak Ridge National Lab., Oak Ridge, Tenn. Feb 60. Contract W-7405-eng-26. 26p. Order from OTS. $1.00. ORNL-2815

Purification of Americium chloride solutions by mercury cathode electrolysis, by J. L. Holst and C. W. Barrick. The Dow Chemical Co., Rocky Flats Plant, Denver, Colo. Mar 60. Contract AT(29-1)-1106. 9p. Order from OTS. 50 cents. REP-183

Intermetallic compounds between lithium and lead V. Brillouin polyhedra of the various phases, by W. J. Ramsey and J. O. Jepson. University of California, Lawrence Radiation Lab., Livermore, Calif. Nov 59. Contract W-7405, eng-48. 16p. Order from OTS. 50 cents. UCRL-5801

Chemistry Division semiannual report, June through November 1959. University of California, Lawrence Radiation Laboratory, Livermore, Calif. Feb 60. Contract W-7405-eng-48. 103p. order from OTS. $2.50. UCRL-9093

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The gravimetric determination of hafnium and zirconium in hafnium materials. (Tentative Method), by T. M. Reinhold. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. Apr 59. 4p. Order from LC. Mi $1.80, ph $1.80. WAPD-M(GLA)-718

An evaluation of uranium salvage operations - a case study, by A. E. Sands. Union Carbide Nuclear Co. Div. of Union Carbide Corp., Y-12 Plant, Oak Ridge, Tenn. Dec 59. Contract W-7405-eng-26. 75p. Order from OTS. $2.00. Y-1279

Chemistry—Radiation and Radiochemistry

Effectsof gamma radiation on the kinetics of chlorination of some aromatic hydrocarbons. Part I. Chlorination of mesitylene and naphthalene. Part II. Chlorination of ethyl benezen Part III. Chlorination of M-xylene and methyl naphthalenes, by J. J. Martin and others. University of Michigan. Engineering Research Inst., Ann Arbor, Mich. [195?] 69p. Order from LC. Mi $3.90, ph $10.80. AECU-4339

Radiochemical separation of cadmium and the application of vacuum distillation of metals to radiochemical separations, by J. R. DeVoe. University of Michigan, Ann Arbor, Mich. Dec 59. Contract AT(11-1)-70. 91p. Order from OTS. $2.50. AECU-4610

California production in the high flux isotope reactor, by H. C. Claiborne and M. P. Lietzke. Oak Ridge National Lab., Oak Ridge, Tenn. Aug 59. 24p. Order from LC. Mi $2.70, ph $4.80. CF-59-8-125

Removal of iodine from aqueous solutions by sparging, by C. H. Holm. Hanford Works, Richland, Wash. June 51. Decl. with detetions July 7, 1959. Contract W-31-109-Eng-52. 39p. Order from LC. Mi $3.00, ph $6.30. HW-20803(Del.)

The stability of purex solvent to radiation and chemical attack, by J. L. Swanson. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. May 55. Decl. with deletions Aug. 25, 1959. Contract W-31-109-Eng-52. 30p. Order from LC. Mi $2.70, ph $4.80. HW-38263(Del.)

General research quarterly report for January, February, March 1950. Mound Lab., Miamisburg, Ohio. Apr 50. Decl. Nov 24, 1959. Contract AT-33-3-GEN-53. 27p. Order from LC. Mi $2.70, ph $4.80. MLM-443-3

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The radiochemistry of thorium, by E. K. Hyde. Lawrence Radiation Lab., University of Calif., Berkeley, Calif. Jan 60. 70p. Order from OTS. 75 cents. NAS-NS-3004

The radiochemistry of fluorine, chlorine, bromine and iodine, by J. Kleinberg and G. A. Cowan. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Jan 60. 42p. Order from OTS. 50 cents. NAS-NS-3005

The radiochemistry of chromium, by J. Pijck. University of Ghent, Laboratory for Analytical Chemistry, Belgium, Jan 60. 34p. Order from OTS. 50 cents. NAS-NS-3007

Report on ammonia synthesis test, by Y. Solomon and P. Cohen. Westinghouse Electric Corp., Atomic Power Div., Pittsburgh, Pa. Mar 54. Decl. with deletions Apr 29, 1957. 9p. Order from LC. Mi $1.80, ph $1.80, WAPD-CP-354(Del.)

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Chemical Engineering Division summary report, for October, November, December, 1959, by S. Lawroski and others. Argonne National Laboratory, Argonne, Ill. Feb 60. Contract W-31-109-eng-38. 170p. Order from OTS. $3.00. ANL-6101

PRFR pilot leaching plant--preliminary process design, by H. A. McLain Oak Ridge National Lab., Tenn. July 59. Contract W-7405-eng-26. 59p. Order from LC. Mi $3.60, ph $9.30. CF-59-7-76

Report of chemistry and chemical engineering for November, December, 1956, January, 1957, by D. H Ahmann and others. June 57. Decl. Mar 17, 1960. Contract W-31-109-Eng-52. 67p Order from OTS. 50 cents. KAPL-1696

Gaseous chemical treatment of irradiated uranium dioxide, by J. Guon and F. D. Rosen. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Jan 60. Contract AT(11-1)-GEN-8. 18p. Order from OTS. 75 cents. NAA-SR-4612

Laboratory development of the sulfex process for the dissolution of consolidated Edison power reactor fuel, by L. M. Ferris and A. H. Kibbey. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 28p. Order from OTS. $1.00. ORNL-2714

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Chemical feasibility of homogeneous neutron poisons for criticality controls in consolidated Edison fuel processing solutions, by J. G. Moore and R. H. Rainey. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 22p. Order from OTS. 75 cents. ORNL-2854

Proceedings of the AEC Symposium for chemical processing of irradiated fuels from power, test, and research reactors held at Richland, Wash., on October 20 and 21, 1959, by J. E. Travis and others. General Electric Co., Hanford Atomic Products Operation, Richland, Wash. Jan 60. 455p. Order from OTS. $4.50. TID-7583

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Effect of plasma potential on DCX steady state, by T. K. Fowler. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 22p. Order from OTS. 75 cents. ORNL-2914

The hard-core pinch. Part I, by D. H. Birdsall, S. A. Colgate and H. P. Furth. University of California. Lawrence Radiation Lab., Livermore, Calif. July 59. Contract W-7405-eng-48. 13p. Order from LC. Mi $2.40, ph $3.30. UCRL-5599

Zeus firing systems, by J. A. Johnson. Sandia Corporation, Albuquerque, N. Mex. Mar 60. 10p. Order from OTS. 50 cents. SCTM-214-59(12)

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Flat flux cores, by R. Balent. Atomics Intenational Div., North American Aviation, Inc., Canoga Park, Calif. June 54. Decl. with detetions Oct. 22, 1959. 15p. Order from LC. Mi $2.40, ph $3.30. NAA-SR-Memo-913(Rev. II)(Del.)

Nuclear calculations for the organic moderated exponential experiments, by J. J. McClure. Atomics International Div., North American Aviation, Inc., Canoga Park, Calif. Mar 59. 8p. Order from LC. Mi $1.80, ph $1.80. NAA-SR-Memo-3659

Calculations on the TRX critical assembly, by L. Maki and W. Allen. Atomics International Div., North American Aviation, Inc., Canoga Park, Calif. [1959?] 5p. Order from LC. Mi $1.80, ph $1 80. NAA-SR-Memo-3892

Critical mass of an OMR core using plate type fuel elements, by H. C. Field. Atomics International Div., North American Aviation, Inc., Canoga Park, Calif. June 59. 4p. Order from LC. Mi $1.80, ph $1.80. NAA-SR-Memo-3980

Critical mass calculations--correction, by R. A. Blaine. Atomics International Div., North American Aviation, Inc., Canoga Park, Calif. Aug 59. 4p. Order from LC. Mi $1.80, ph $1.80. NAA-SR-Memo-4299

Safety analysis of enriched uranium processing. A study of the possible consequences of nuclear accidents in licensed plants processing unirradiated enriched uranium, by H. T. Williams and others. CONVAIR, A Division of General Dynamics Corp., Fort Worth, Tex. Mar 60. Contract AT(30-1)-2271. 199p. Order from OTS. $3.00. NYO-2980

Geology and Mineralogy

Geochemistry and physics of ocean circulation, by W. S. Broecker and others. Columbia University, Lamont Geological Observatory, Palisades, N. Y. 1959? Contract AT(30-1)-1808. 36p. Order from LC. Mi $3.00, ph $6.30. NYO-2921

Thermograd measurements in water and sediments of the deep sea, by M. Ewing, R. D. Gerard, and M. Langseth. Columbia University, Lamont Geological Observatory, Palisades, N. Y. Sep 59. Contract AT(30-1)-1808. 42p. Order from LC. Mi $3.30, ph $7.80. NYO-2922

Preliminary drilling in the Powder River Basin, Converse, Campbell, and Johnson Counties, Wyoming, by H. E. Geslin and C. P. Bromley. Division of Raw Materials, AEC Denver Area Office, Denver, Colo. June 57. 26p. Order from OTS. 75 cents. RME-1070 (Rev.)

Preliminary report on the geology and uranium deposits of Haiwee Ridge, Inyo County, California, by W. R. Power. U. S. Atomic Energy Commission, Grand Junction Operation Office, Production Evaluation Div., Salt Lake Branch, Salt Lake City, Utah. May 58. 39p. Order from OTS. $1.25. RME-2066

Health and Safety

A system for the automatic computation of disintegration rates from radiochemical data, by W. R. Collins, Jr. Health and Safety Laboratory, AEC, New York Operations Office, New York, N. Y. May 59. 45p. Order from OTS. $1.50. HASL-64

Strontium program. Quarterly summary report for September 1 through December 1, 1959, by E.P. Hardy, Jr. and S. Klein. Health and Safety Laboratory, AEC, New York Operations Office, New York, N. Y. Jan 60. 221p. Order from OTS. $3.50. HASL-77

Fallout program. Quarterly summary report for December 1, 1959 through March 1, 1960, by E. P. Hardy, Jr. and S. Klein. Health and Safety Laboratory, AEC, New York Operations Office, New York, N. Y. Apr 60 180p. Order from OTS. $3.00. HASL-84

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An absolute mass rate flowmeter, by F. A. Guevara and others Los Alamos Scientific Lab , N. N. Mex. [1958?] Contract W-7405-eng-36. 9p. Order from LC. Mi $1.80, ph $1.80. AECU-4249

A scintillation nuclear incident alarm monitor, by W. G. Spear General Electric Co., Hanford Atomic Products Operation, Richland, Wash. Mar 59. Contract W-31-109-Eng-52. 13p. Order from LC. Mi $2.40, ph $3.30. HW-59612

The operation and maintenance of an alpha energy analyzing system, by F. P. Brauer and R. E. Connally. General Electric Co., Hanford Atomic Products Operation, Richland, Wash. July 59. 33p. Order from LC. Mi $3.00, ph $6.30. HW-60974

Ultrasonic resin level detector, by D. O. Hunter and C. L. Pleasance. Hanford Atomic Products Operation, Richland, Wash. Jan 60 Contract AT(45-1)-1350. 22p. Order from OTS. 75 cents. HW-63632

A continuous boiling point analyzer and its application to the hydrogen fluoride-water system, by W. S. Pappas, Union Carbide Nuclear Co , Division of Union Carbide Corportation, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Feb 60. 15p. Order from OTS. 50 cents. K-1354

A high-temperature metal resistance furnace for vacuum or pressure operation, by M. R. Nadler, J. E. Runyan, and C. P. Kempter. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Dec 59. Contract W-7405-ENG-36. 17p. Order from OTS. 75 cents. LAMS-2393

Strontium-90 power project quarterly progress report I. Martin Co. Nuclear Div., Baltimore Md. Jan 59. 52p. Order from LC. Mi $3.60, ph $9.30. MND-SR-1672

The non-linear behavior or large permanent-magnet flowmeters, by G. E. Turner. Atomics International A Division of North American Aviation, Inc., Canoga Park, Calif. Apr 60. Contract AT(11-1)-GEN-8. 18p. Order from OTS. 50 cents. NAA-SR-4544

An analytical method of determining pole locations of certain types of feedback amplifiers, by R. L. Gamblin. Princeton University, Project Matterhorn, Princeton, N. J. Feb 59. Contract AT (30-1)-1238. 16p. Order from LC. Mi $2.40, ph $3.30. NYO-2396

Calibration and testing of 2- and 3-1/2-in. magnetic flowmeters for high-temperature NaK service, by R. G. Affel, G. H. Burger, and C. L. Pearce. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 71p. Order from OTS. $2.25. ORNL-2793

A theoretical examination of a variable reluctance diaphragm gage developed at Sandia Corporation, by G. E. Reis. Sandia Corporation, Albuquerque, N. Mex. Mar 60. 52p. Order from OTS. $1.50. SCR-162

On the relationship between DC large signal current gain and AC small signal current gain for a common base transistor connection, by T. E. Lommasson. Sandia Corp., Albuquerque, N. Mex. Oct 55. 4p. Order from LC. Mi $1.80, ph $1.80. SCTM-219-55-53

Theory of an electrostatic energy supply; analysis of nondestructive methods for the measurement of internal charges, by H. G. Baerwald. Sandia Corporation, Albuquerque, N. Mex. Mar 60. 89p. Order from OTS. $2.25. SCTM-241A-59(51)

Remote control equipment. A literature search, by H. D. Raleigh. Technical Information Sevvice, Oak Ridge, Tenn. Mar 60. 20p. Order from OTS. 75 cents. TID-3549

Transducer system response tests, by R. Masnovi. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh, Pa. Oct 58. 26p. Order from LC. Mi $2.70, ph $4.80. WAPD-TH-450

Evaluation of aerial survey meter v-780, by R. B. Martin. Office of Civil and Defense Administration, Oak Ridge, Tenn. Nov 59. 40p. Order from OTS. $1.25. WT-1721

Metallurgy and Ceramics

Progress relating to civilian applications during February, 1960, by R. W. Dayton and C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. Mar 60. Contract W-7405-eng-92. 95p. Order from OTS. $2.25. BMI-1423

Development of thorium-uranium-base fuel alloys, by M. S. Farkas, A. A. Bauer, and R. F. Dickerson. Battelle Memorial Institute, Columbus, Ohio. Mar 60. Contract W-7405-eng-92. 28p. Order from OTS. $1.00. BMI-1428

Extrusion of uranium for Hanford cored slug program - VIII, by G. T. Murray and R. M. Treco. Bridgeport Brass Company, Bridgeport, Conn. Sep 56. Decl. Mar. 24, 1960. Contract AT(30-1)-1405. 22p. Order from OTS 35 cents. BRB-21

Extrusion of uranium for Hanford cored slug program - IX, by G. T. Murray and R. M. Treco. Bridgeport Brass Company, Bridgeport, Conn. Aug 56. Decl. Mar. 24, 1960. Contract AT(30-1)-1405. 29p. Order from OTS. 35 cents. BRB-22

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Monthly progress report covering period September through October, 1955, by R. M. Treco. Bridgeport Brass Company, Bridgeport, Conn. Nov 55. Decl. Mar. 24, 1960. Contract AT(30-1)-1405. 16p. Order from OTS. 30 cents. BRB-25

Monthly progress report covering period November through December, 1956, by A. E. Schuetz and H. S. Rubenstein. Bridgeport Brass Company, Bridgeport, Conn. Mar 57. Decl. Mar. 24, 1960. Contract AT(30-1)-1405. 53p. Order from OTS. 50 cents. BRB-37

Process development quarterly report covering the period from January through March, 1957, by E. E. Schuetz and H. S. Rubenstein. Bridgeport Brass Company, Bridgeport, Conn. June 57. Decl. Mar. 24, 1960. Contract AT(30-1)-1405. 80p. Order from OTS. 55 cents. BRB-38

Graphite-metal compatibility at high temperatures, by J. J. Barry and others. General Dynamics Corporation. June 59. Contract AT(04-3)-187. 70p. Order from OTS. $2.00. GA-782

Compatibility of zirconium hydride and carbon dioxide, by H. E. Shoemaker. General Dynamics Corporation July 59. Contract AT (04-3)-187. 17p. Order from OTS. 75 cents. GA-849

Evaluation of aluminum for use in reactors cooled by high-temperature recirculating water, by J. A. Ayres. Hanford Atomic Products Operation, Richland, Wash. Feb 60. Contract AT (45-1)-1350. 25p. Order from OTS. $1.00. HW-61757 REV

Fabrication of aluminum - 1.8 w/o plutonium PCTR loading, by J. B. Burnham. Hanford Atomic Products Operation, Richland, Wash. Nov 59. Contract AT(45-1)-1350. 22p. Order from OTS. 75 cents. HW-62821

Sintering studies on the system UO_2-PuO_2 Part II - Sinterability, by T. D. Chikalla. Hanford Atomic Products Operation, Richland, Wash. Dec 59. Contract AT(45-1)-1350. 35p. Order from OTS. $1.00. HW-63081

Specifications for swaged UO_2 19-rod cluster, PRTR fuel element Mark I, by M. K. Millhollen Hanford Atomic Products Operation, Richland, Wash. Mar 60. Contract AT(45-1)-1350. 28p. Order from OTS. $1.00. HW-64359

Uranium glasses. I. Fundamental considerations, by C. D. Wirkus and D. R. Wilder. Iowa State University of Science and Technology, Ames Laboratory, Ames, Iowa. Feb 60. Contract W-7405-eng-82. 19p. Order from OTS. 75 cents. IS-107

Mechanical properties of stainless steel - UO_2 dispersion fuel elements, by W. D. Valovage and R. A. Siergiej. General Electric Co., Knolls Atomic Power Laboratory, Schenectady N. Y. July 59. Contract W-31-109-Eng-52. 12p. Order from OTS. 75 cents. KAPL-1590

Internal-pressure creep-rupture tests of Zircaloy-2 tubing, by G. J. Sokol and D. T. Groleau. General Electric Co., Knolls Atomic Power Lab., Schenectady, N. Y. Jan 60. Contract W-31-109-Eng-52. 15p. Order from OTS. 75 cents. KAPL-2072

Properties of beryllium metal, by H. Suss. Knolls Atomic Power Lab., Schenectady, N. Y. Sep 59. 15p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-HOS-7

Shot peening for protection against stress corrosion cracking, by H. Suss. Knolls Atomic Power Lab., Schenectady, N. Y. Sep 59. 15p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-HOS-9

Progress report on weld penetration study of Zircaloy-2 hafnium welds as determined by radiographic inspection, by M. A. Gerardi. Knolls Atomic Power Lab., Schenectady, N. Y. Dec 59. 11p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-MAG-1

Electrophoretic processes - nuclear aspects. Final report for December 1, 1956 through June 30, 1959, by R. A. Keeler and S. J. Klach. Vitro Laboratories, West Orange, N. J. Sep 59. Contract AT(30-1)-1996. 42p. Order from OTS. $1.25. KLX-10119

Fabrication of zirconium-clad uranium fuel elements, by P. Loewenstein. Massachusetts Institute of Technology, Cambridge, Mass. Jan 51. Decl. Mar. 17, 1960. 5p. Order from OTS. 25 cents. MIT-PL-12

Some properties of uranium-molybdenum alloy fuels for organic moderated reactors, by W. H. Friske. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Apr 60. Contract AT(11-1)-GEN-8. 26p. Order from OTS. 75 cents. NAA-SR-4646

Evaluation of irradiated experimental OMR fuel elements I, by J. H. Walter, E. E. Garrett, and J. M. Davis. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Apr 60. Contract AT(11-1)-GEN-8. 49p. Order from OTS. $1.25. NAA-SR-4670

On the mechanisms of volume self-diffusion in α-Fe and γ-Fe, by C. J. Meechan. Atomics International, A Division of North American Aviation, Inc., Canoga Park, Calif. Apr 60. Contract AT(11-1)-GEN-8. 10p. Order from OTS. 50 cents. NAA-SR-4806

Development of roll bonded subassembles, by F. G. Stengel. Westinghouse Electric Corp Atomic Power Div., Pittsburgh, Pa. Dec 54. Decl. with deletions Feb 20, 1957 Contract AT-11-1-GEN-14. 24p. Order from LC. Mi $2.70, ph $4.80. WAPD-116 (Del.)

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Linac injection for the 340-Mev Berkeley electron synchrotron: Part I - theoretical, by K. C. Crebbin and J R. Hiskes. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. Jan 60. Contract W-7405-eng-48. 24p. Order from OTS. 75 cents. UCRL-9057

Physics and Mathematics

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